REGION 5 RAC2

REMEDIAL ACTION CONTRACT FOR

Remedial, Enforcement Oversight, and
Non-Time Critical Removal Activities at Sites of Release
or Threatened Release of Hazardous Substances in Region 5

FEASIBILITY STUDY REPORT FOR PCB-CONTAMINATED SOIL

OMC Plant 2 Site
Waukegan, Illinois

WA No. 148-RICO-0528/Contract No. EP-S5-06-01

July 2012

PREPARED FOR

U.S. Environmental Protection Agency

PREPARED BY

CH2M HILL

FOR OFFICIAL USE ONLY

Feasibility Study Report for PCB-contaminated Soil

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Feasibility Study

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Executive Summary

This feasibility study report presents the remedial alternatives to address the contaminated subsurface soils at the Outboard Marine Corporation (OMC) Plant 2 Site in Waukegan, Illinois. The objective of the report is to incorporate the findings of the 2011 remedial action activities in the development of alternatives to remediate or control the subsurface soils contaminated with polychlorinated biphenyls remaining below the water table and to adequately protect human health and the environment.

The remedial action objectives (RAOs) were developed to protect human health and the environment based on the nature and extent of the contamination, resources that are currently and potentially threatened, and potential for human and environmental exposure as determined by the human health and ecological risk assessments. To meet the RAOs, preliminary remediation goals were developed to define the extent of contaminated media requiring remedial action at the OMC Plant 2 Site.

Consistent with the RAOs and preliminary remediation goals, remedial technologies and process options were identified and screened. Remedial technologies and process options that remained after screening were assembled into a range of alternatives. The potential alternatives encompass, as specified in the National Oil and Hazardous Substances Pollution Contingency Plan, a range of alternatives to reduce the toxicity, mobility, or volume of wastes, but vary in the degree to which long-term management of residuals or untreated waste is required. There are no principal threat wastes that need to be considered in the evaluation of the reduction of toxicity, mobility, and volume by treatment. Based on the risks present at the site and the remaining remedial technologies and process options available after completion of the screening, the following alternatives were assembled and then evaluated against the seven criteria identified in the National Oil and Hazardous Substances Pollution Contingency Plan. As required, a no further action alternative was also evaluated.

- Alternative 1—No action
- Alternative 2—Illinois Administrative Code 807 cap or 811 cap, Institutional Controls and Monitoring
- Alternative 3—Illinois Administrative Code 807 cap or 811 cap, Vertical Barrier, Institutional Controls, and Monitoring
- Alternative 4—In Situ Treatment, Institutional Controls, and Monitoring
- Alternative 5—Excavation and Disposal and Institutional Controls

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Acronyms and Abbreviations

ARAR	applicable or relevant and appropriate requirement
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
CPAH	carcinogenic polynuclear aromatic hydrocarbon
DNAPL	dense nonaqueous phase liquid
ELCR	excess lifetime cancer risk
EO	Executive Order
FS	feasibility study
g/kg	grams per kilogram
IAC	Illinois Administrative Code
IEPA	Illinois Environmental Protection Agency
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
NCP	National Contingency Plan
ODC	Old Die Cast Area
O&M	operation and maintenance
OMC	Outboard Marine Corporation
PCB	polychlorinated biphenyl
RCRA	Resource Conservation and Recovery Act
PRG	preliminary remediation goal
RA	remedial action
RAO	remedial action objective
RI	remedial investigation
ROD	Record of Decision
TACO	tiered approach to corrective action objectives
TBC	to be considered
TMV	toxicity, mobility, or volume
TSCA	Toxic Substance Control Act
USEPA	U.S. Environmental Protection Agency
WCP	Waukegan Manufacturing and Coke Plant Site
yd^3	cubic yard

SECTION 1

Introduction

1.1 Purpose

This feasibility study (FS) report presents the remedial alternatives to address the contaminated subsurface soils at the Outboard Marine Corporation (OMC) Plant 2 Site in Waukegan, Illinois. This document supplements the *Feasibility Study Report* (CH2M HILL 2006a) completed for the site in January 2007. The U.S. Environmental Protection Agency (USEPA), in consultation with the Illinois Environmental Protection Agency (IEPA), selected a remedy in September 2007 to address the contaminated building materials, soils, and sediments. This document is being prepared under Work Assignment No. 148-RICO-0528 of the Remedial Action Contract 2 No. EP-S5-06-01.

The implementation of the remedial action (RA) addressing the building materials, soils, and sediments was substantially completed in 2011. Hence, this document focuses solely on the subsurface soils contaminated with polychlorinated biphenyls (PCBs) remaining below the water table that were not excavated during the 2011 RA activities. This report incorporates the analytical results from the soil RA to define the nature and extent of the soils requiring remediation to be addressed in this report.

The alternatives developed include those alternatives that will remediate or control the subsurface soils contaminated with PCBs to adequately protect human health and the environment. The potential alternatives encompass, as specified in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), a range of alternatives to reduce the toxicity, mobility, or volume of wastes, but vary in the degree to which long-term management of residuals or untreated waste is required. There are no principal threat wastes that need to be included in the evaluation of the reduction of toxicity, mobility, and volume by treatment.

1.2 Organization

This report consists of five sections. Section 1 provides an introduction to the site and updates the site conceptual model based on the results of the soil remediation.

Section 2 summarizes the remedial action objectives (RAOs) and preliminary remediation goals (PRGs) developed in the 2007 FS Report for the soil and groundwater. An updated summary of the applicable or relevant and appropriate requirements (ARARs) is provided in Appendix A.

Section 3 contains information about the general response actions that address the RAOs and introduces the identification and screening of the technology types and process options. Remedial technologies were screened to focus the detailed analysis on only those technologies most applicable to the PCB-contaminated soils remaining below the water table.

Section 4 covers the screened technologies developed and assembled into remedial action alternatives that achieve some or all of the RAOs, provide a range of levels of remediation, and a corresponding range of costs.

Section 5 provides a detailed analysis of the alternatives developed in Section 4. The detailed analysis addresses the NCP evaluation criteria. Two additional criteria used in the evaluation of alternatives and the selection of a remedy—state/federal acceptance and community acceptance—will be addressed following public comment on the FS. The basis and detailed cost estimates for the alternatives are provided in Appendix B.

Section 6 provides the reference documents used during the preparation of this report.

1.3 Site Description

The following sections briefly describe the physical location of the site; its operational history; the geologic, hydrogeologic, and ecological setting; the nature and extent of contamination; contaminant fate and transport; and summary of human health and ecological risks. A summary of results from previous investigations is

presented in the *Field Sampling Plan* (CH2M HILL 2004), and the *Remedial Investigation Report* (*RI report*; CH2M HILL 2006b). A description and results of the soil RA are provided in the *Supplemental Design Report Area 3, Area 5, New Smelter Slab Area, and Concrete and Contract Documents* (including specifications and drawings for supplemental RA) (SulTRAC 2011a) and the *Interim Remedial Action Report—Slab, Soil, and Sediment Remediation* (SulTRAC 2012).

1.3.1 Site Location

The OMC Plant 2 Site is the fourth of four operable units of the OMC National Priorities List site and is located at 90 E. Seahorse Drive in Waukegan, Illinois (Figure 1). The OMC Plant 2 Site is a 65-acre lakefront parcel that contained an abandoned 1,036,000-square-foot former manufacturing plant building (Plant 2) and several parking lot areas to the north and south of the building complex (Figure 2). The OMC Plant 2 property also includes two PCB containment cells in which PCB-contaminated sediment (dredged from Waukegan Harbor in the early 1990s) and PCB-impacted soil (from the RA conducted by OMC in the early 1990s) are managed. The cells (the East Containment Cell and the West Containment Cell) are located north of the plant building.

The site is situated in an area of mixed industrial, recreational, and municipal land uses (Figure 2). The OMC Plant 2 Site is bordered to the north by the North Ditch and North Shore Sanitary District and to the east by the public beach and dunes along Lake Michigan. Seahorse Drive forms the southern site boundary, with the Waukegan Manufacturing and Coke Plant Site (WCP) and Waukegan Harbor farther to the south. The western site boundary is bordered by railroad tracks and a utility corridor that includes an aging, 51-inch-diameter sewerline connecting nearby suburbs to the North Shore Sanitary District treatment plant.

This report addresses three specific areas at the OMC Plant 2 Site (Figure 3). The primary area is an approximate 5-acre area in the western portion of the former Plant 2 building and is referred to as the Old Die Cast (ODC) Area. The ODC area and the adjacent PCB dense nonaqueous phase liquid (DNAPL) area in the south parking lot are discussed as one area. The other two areas consist of areas related to locations of utility lines. The North Utility Corridor is an area adjacent to the North Ditch on the northern site boundary and overlies the Nicor gas line. The North Utility Corridor is referred to as Area 4 in the soil RA documents. The West Utility Corridor includes the area along the railroad tracks on the western site boundary.

1.3.2 Background

OMC designed, manufactured, and sold outboard marine engines, parts, and accessories from about 1948 to 2000. Plant 2 was a main manufacturing facility for OMC, and the major production lines used PCB-containing hydraulic and lubricating/cutting oils, chlorinated solvent-containing degreasing equipment, and smaller amounts of hydrofluoric acid, mercury, chromic acid, and other similar chemical compounds.

Reports indicate that from 1961 to 1972 OMC purchased about 8 million gallons of hydraulic fluid containing PCBs to use as a lubricant in its aluminum die casting machines. During the manufacturing process, some of the hydraulic fluid spilled into floor drains that discharged to an oil interceptor system. As a result, large quantities of PCBs were released directly to Waukegan Harbor in the western end of former Slip 3 and on the OMC property into a series of ditches, and the parking lot. By the time the discharge pipe to the harbor was sealed in 1976, about 300,000 pounds of PCBs had been released into the Waukegan Harbor and another 700,000 pounds to the OMC property near the North Ditch (USEPA 2002). OMC completed an RA in 1994 that included dredging and containment of the PCB-contaminated sediments from the northern portion of Waukegan Harbor, construction of the two containment cells, and excavation, treatment, and/or containment of PCB-contaminated soil and sediment.

OMC declared bankruptcy in December 2000 and ceased all manufacturing operations in August 2001. The City of Waukegan owns much of the OMC Plant 2 Site and is responsible for the operation and maintenance (O&M) of the PCB containment cells.

1.3.3 Recent Actions

Since the late 1970s, the OMC complex has been the subject of investigation and remediation (primarily for PCBs). The information on the most recent activities conducted by USEPA at the site is briefly summarized in the following subsections.

1.3.3.1 Remedial Investigation

USEPA began an RI at the OMC Plant 2 Site in 2004 to determine the nature and extent of contamination in sediment and soil, within the OMC Plant 2 building, and the groundwater. The RI report, including the investigation results and human health and ecological risk assessments, was issued in April 2006. The RI identified the following potential environmental problems related to the soil and building media (CH2M HILL 2006b):

- PCB-contaminated concrete floors, walls, and ceilings exist in the ODC, parts storage, and metal working areas.
- Soil beneath the northern and southern parking lot areas and east of the plant contain PCBs and/or carcinogenic polynuclear aromatic hydrocarbons (CPAHs) at levels that exceed their respective preliminary cleanup goals.

1.3.3.2 Feasibility Study and Record of Decision

USEPA conducted an FS beginning in 2005 to examine site cleanup alternatives designed to protect human health and the environment. The FS report was issued in December 2006 (CH2M HILL 2006a). Based on the findings of the RI and FS, USEPA determined that PCBs and CPAHs in OMC Plant 2 Site soil and sediment present unacceptable risks to current and future human and ecological receptors. In addition, PCB levels inside the OMC Plant 2 building would also present unacceptable risks to future human receptors if left unaddressed.

The Record of Decision (ROD) issued for the site, selected a remedy for the soil and sediment and building media that consists of the following components (USEPA 2007):

- The excavation of soil and sediment that contain concentrations exceeding 1 part per million PCBs and/or 2 parts per million CPAHs.
- The abatement of asbestos-containing material.
- The demolition and removal of OMC Plant 2 building materials.
- The offsite disposal of soil, sediment (as required), and building debris.

1.3.3.3 PCB DNAPL Investigation

During groundwater investigation activities conducted in 2006, approximately 6 to 8 inches of DNAPL were encountered in a deep monitoring well (MW-517D) adjacent to the former hazardous waste storage building (Figure 4). The product was dark brown/black in color, highly viscous, and had minimal odor. DNAPL had not been observed at this location during the RI sampling in 2005. Analytical results of the product indicated that the DNAPL contains 1,100 grams per kilogram (g/kg) of Aroclor 1248. The 2005 groundwater data were reviewed and 61 micrograms per liter (µg/L) of Aroclor 1248 and 110 µg/L of Aroclor 1232 were detected in samples from the shallow (MW-517S) and deep (MW-517D) wells at this location, respectively.

In response to the presence of the PCB DNAPL, an additional well nest (MW-530) was installed downgradient of the PCB-impacted well (MW-517D). Groundwater samples were collected in March 2007 from the shallow PCB-impacted well (MW-517S), upgradient monitoring wells, and downgradient wells (MW-530). PCBs were only detected in the groundwater sample from the shallow well (MW-517S) above the DNAPL at concentrations of 100 and 9.3 µg/L for Aroclors 1248 and 1260, respectively.

A limited subsurface investigation was conducted in June 2008 to delineate the extent of the PCB DNAPL (Figure 4). The focused investigation included continuous soil sampling to the base of the aquifer (that is, to a depth no greater than 25 feet below ground surface [bgs]) from borings located in the parking lot outside the ODC portion of the building, the former hazardous waste storage building, and on the north side of the ramp

connecting ODC to the former hazardous waste storage building. Evidence of DNAPL was not observed in any of the borings except SO-248 where an oily texture indicative of the PCB DNAPL was noted for soils from about 10 to 18 feet bgs. The results of the investigation indicated that the source of the PCB DNAPL is not in the immediate vicinity of the well and is likely beneath the ODC or former hazardous waste storage buildings.

1.3.4 Building, Soil, and Sediment Remedial Action

RA activities to address the contaminated soil and sediment and OMC Plant 2 building media were performed in 2010, 2011, and 2012. The RA activities included the following:

- Asbestos abatement and building demolition to the slab
- Pre-remediation investigation activities
- Removal, crushing, transportation, and offsite disposal of the Plant 2 slab
- Excavation, transportation, and offsite disposal of subslab soil to an average depth of 3 to 4 feet below surrounding ground surface
- Excavation, transportation, and offsite disposal of contaminated soil from predetermined areas identified during the RI and pre-remediation investigation activities
- Excavation, transportation, and offsite disposal of sediment from the North Ditch and the South Ditch with subsequent capping of the North Ditch
- Removal of the slab of the Former Smelter Building, followed by crushing and onsite reuse of crushed concrete
- Excavation, transportation, and disposal of soil from the Former Smelter Building Area
- Excavation of contaminated soil and restoration of the Dune Area

The remediation activities address the contamination identified in the scope of the *Basis of Design Report* (CH2M HILL 2008) and the *Addendum to the Basis of Design* (CH2M HILL 2009).

Soil remediation activities were conducted in a number of site areas including the subslab area below the former Plant 2 building and in the defined soil remediation areas (Figure 3). Soil was first excavated to the targeted depth based on the design or to the depth identified in the subslab investigations. Following this soil removal, soil was excavated iteratively from the bases and sidewalls based on results of confirmation sampling. Soil removal was generally terminated at the apparent water table unless sampling indicated that soil exceeding the Toxic Substance Control Act (TSCA) criteria of 50 milligrams per kilogram (mg/kg) was still present. Excavation in the areas continued until the soil concentrations were below 50 mg/kg. Soil excavation resulted in removal of soil exceeding TSCA criteria except: (1) within the ODC area, (2) in an area at the eastern end of the eastern containment cell that was too close to the cell for excavation, and (3) in some areas near the Former Smelter Building Area. The residual TSCA material near the eastern containment cell was capped and the Former Smelter Building Area will be addressed as part of supplemental remediation to be performed in 2012 (SulTRAC 2012).

Confirmation sampling results indicated very high concentrations of PCBs in samples from the ODC area, suggesting that contamination likely extends to much greater depths below the water table in that area, thus rendering conventional excavation infeasible. As a result, USEPA and IEPA agreed to manage the material in place, under a temporary cap, until a supplemental remediation could be implemented. The temporary cap consists of the recycled concrete from the Former Smelter Building Area and the former city-crushed concrete piles from the eastern plant. Development and evaluation of remedial alternatives for the ODC area is the focus of this document.

1.4 Physical Site Setting

1.4.1 Local Demography and Land Use

1.4.1.1 Current Conditions

The current land use in the vicinity of OMC Plant 2 is primarily marine-recreational and industrial, but also includes a utility corridor and the railroad to the west, the North Shore Sanitary District plant on the north, and a dune area and public beach east of the site (Figure 2). Waukegan Harbor, south of the site, is an industrial and commercial harbor used by lake-going freighters and recreational boaters. The Larsen Marine Service property lies between the OMC Plant 2 Site and Waukegan Harbor. Larsen Marine Service uses Slip 4 for repair, supply, and as docking facilities for private boats.

The Lake County Board and the City of Waukegan classified land use areas in Lake County in 1987. Land surrounding the northern portion of Waukegan Harbor is classified as urban, while the beach areas and water filtration plant properties are classified as open-space areas. The remaining land in the immediate harbor area is classified as special use (Lake County) or residential (City of Waukegan).

The site, surrounding properties, and the City of Waukegan obtain potable water from Lake Michigan. The city has no municipal potable wells. There are some private residential wells within the city limits at a distance from the site (URS/Dames & Moore 2000).

1.4.1.2 Future Land Use

In December 2000, OMC declared Chapter 11 bankruptcy, and began liquidation in August 2001. Subsequently, the City of Waukegan purchased the WCP Site and also acquired the OMC Plant 2 property (Figure 2). The WCP and the OMC Plant 2 sites were rezoned to high-density residential, and the city and other entities are working to revitalize the Waukegan lakefront area.

In December 2003, the City of Waukegan amended its 1987 Comprehensive Plan to include the Waukegan Lakefront-Downtown and Lakefront Master Plan and supporting documents prepared by Skidmore, Owings & Merrill, LLP, and its consulting team (City of Waukegan Ordinance No. 03-O-140). The master plan and documents provided by the City of Waukegan were reviewed with respect to the anticipated future land use of OMC Plant 2 and surrounding properties. The plan defines the northern portion of the OMC Plant 2 property as an eco-park development that transitions to mixed-use marina-related commercial and residential use on the southern portion of the property. The land use west of the OMC Plant 2 Site is planned as roadways, green space, or freight and passenger marshalling yards. Similar plans are anticipated for the WCP site. The city is in the early stages of its process of rezoning various lakefront parcels consistent with the master plan (Deigan & Associates, LLC 2004).

1.4.2 Geologic Setting

The subsurface materials encountered include near-surface fill materials above a naturally occurring sand unit that overlies clay till. The fill deposit extends from 2 to 12 feet bgs. Underlying the fill is a poorly graded sand or silty sand to a depth of about 25 to 30 feet. This relatively permeable sand unit comprises an unconfined aquifer with a geometric mean hydraulic conductivity of about 2.0×10^{-2} centimeters per second and an average porosity of about 30 percent. Beneath the sand unit is 70 to 80 feet of hard gray clay that forms the lower boundary of the unconfined aquifer.

1.4.3 Hydrogeologic Setting

Groundwater is shallow and was encountered within the sand aquifer at depths ranging between 2 and 7 feet, depending on the ground surface elevation. The underlying till unit forms the lower boundary of this unconfined aquifer and likely acts as a barrier to the vertical contaminant migration.

Groundwater flow is generally west to east across the northern portion of the site (toward Lake Michigan) and in the southern portion of the site, groundwater flows toward the south (toward Waukegan Harbor). The overall average site gradient is estimated to be 0.002 foot per foot. The calculated groundwater velocities ranged from

about 70 to 150 feet per year in the shallow zone and 6 to 30 feet per year in the deeper zone of the aquifer. The overall site average groundwater velocity is estimated to be about 70 feet per year. Vertical gradients between the shallow and the deeper portions of the aquifer are almost non-existent.

1.4.4 Ecological Setting

The most significant ecological feature is the 13-acre dune area of the OMC Plant 2 Site, extending from the North Shore Sanitary District's southern property boundary including the North Ditch to the South Ditch (Figure 2). This portion of Waukegan Beach has never been developed with surface structures and is generally inaccessible. Wooded areas have been re-established east of the former seawall barrier and extend from the North Ditch to the South Ditch. Most of the remaining portions of the Waukegan Beach east of the tree line are rolling sand dunes with sporadic tree and natural grass land cover that lead eastward to a gently sloping beach.

There are no wetland areas present onsite. However, there are a few isolated wetland areas east of the site. Three wetland areas are represented by drainage ditches on the north and south edges of the area and by a small depression along the North Ditch near the lakeshore. A narrow terrace along the north side of the South Ditch contained significant amounts of conservative wetland species.

Consultation regarding potential threatened and endangered species and natural communities was initiated with the Illinois Department of Natural Resources, Division of Ecosystems and Environment. Review of the Illinois Department of Natural Resources Ecological Compliance Assessment Tool on June 23, 2010, and a follow-up review on September 28, 2011, identified the following state protected resources: Waukegan Beach Illinois Natural Areas Inventory site, banded killifish (*Fundulus diaphanous*), black-crowned night heron (*Nycticorax nycticorax*), common tern (*Sterna hirundo*), golden sedge (*Carex aurea*), Kalm's St. John's wort (*Hypericulum kalmianum*), marram grass (*Ammophila breviligulata*), peregrine falcon (*Falco peregrines*), Richardson's rush (*Juncus alpinoarticulatus*), sea rocket (*Cakile edentula*),and seaside spurge (*Chamaesyce polygonifolia*) potentially occurring adjacent to the project site.

CH2M HILL reviewed the U.S. Fish and Wildlife Service technical assistance Web site on January 12, 2012, for federally listed threatened and endangered species. According to the Web site, the following five threatened, endangered, or candidate species are listed and may be present in Lake County, as well as one critical habitat location: the piping plover (*Charadrius melodus*), Eastern massasauga (*Sistrurus catenatus*), Karner blue butterfly (*Lycaeides melissa samuelis*), Eastern prairie fringed orchid (*Platanthaera leucophaea*), Pitcher's thistle (*Cirsium pitcheri*), and critical habitat for the piping plover (wide, open, sandy beaches with very little grass or other vegetation).

1.5 Nature and Extent of Contamination

The nature and extent has been revised to reflect current conditions as a result of the pre-remediation and RA activities performed in 2010 and 2011. Field investigations and RA confirmation sampling identified three areas with PCB-contaminated subsurface soils that will not be addressed by the soil RA initiated in 2010. The areas that are addressed by this FS are discussed in the following subsections.

1.5.1 Subsurface Soil in the Old Die Cast Area and PCB DNAPL Area

Soil excavation in the ODC area encompassed about 5 acres and extended approximately 3 to 4 feet below the ground surface to just below the water table to remove soils with PCB concentrations greater than 50 mg/kg. Confirmation soil samples from the base of the excavation contained total PCB concentrations ranging from 30.5 to 11,700 mg/kg. Although the depth of the contamination has not been confirmed by sampling, the high concentrations suggest that contamination likely extends deeper. The distribution of PCB concentrations from the confirmation sampling is provided in Figure 5.

PCB DNAPL was found in a monitoring well south of the ODC area that is screened at the base of the aquifer (about 25 to 30 feet bgs). During the June 2008 investigation to define the extent of the PCB DNAPL, an oily texture indicative of the PCB DNAPL was observed in boring SO-248 in the south parking lot from about 10 to 18 feet bgs. The potential extent of PCB DNAPL is shown in Figure 4 based on the June 2008 investigation.

1.5.2 Subsurface Soil in the North Utility Corridor (Area 4)

Excavation was completed in Area 4 adjacent to the North Ditch as defined by the basis of design. Confirmation soil samples collected from the base and sidewalls of the excavation contain elevated concentrations of PCB, some of which exceed 1,000 mg/kg total PCBs. Area 4 overlies a Nicor gas line over much of its length and is proximate to the West Containment Cell and the new consolidation facility on the south and the North Ditch and related sewerlines on the north. Removal of the contaminated soils exceeding the remedial objective of 1 mg/kg PCBs was not completed in order to prevent damage to the adjacent structures. Figure 6 depicts the PCB concentrations in the confirmation samples in Area 4 and also shows the approximate location of the utilities, the containment cell, and the retention basin (SulTRAC 2010).

Additional soil investigations were conducted in February 2011 to investigate the extent of elevated PCB concentrations in Area 4. The investigation included two borings northwest of the West Containment Cell to examine PCB concentrations within the area enclosed by the slurry wall of the West Containment Cell and the 51-inch-diameter sewerline. Samples were collected at 1-foot intervals to a depth of 5 feet. The North Utility Corridor includes the contamination from Area 4 and extends north toward the property boundary, perhaps in association with the east-west storm sewerline that discharges into the North Ditch. Total PCB concentrations from the borings installed northwest of the West Containment Cell ranged from 0.077 to 7.9 mg/kg (SulTRAC 2011b).

1.5.3 Subsurface Soil in the West Utility Corridor

The West Utility Corridor includes a 51-inch-diameter sewerline to the North Shore Sanitary District treatment plant along the western site boundary. Utility maps also indicate that a portion of the sewer lies beneath the Former Hazardous Waste Storage Building. Based on the interconnection of the utilities on the western side of the site and the high PCB concentrations in the subsurface soils beneath the ODC area and the PCB DNAPL, it is likely that the subsurface soil contamination extends into the West Utility Corridor.

During the February 2011 investigation of the extent of elevated PCB concentrations in Area 4, two borings were also advanced and sampled adjacent to the West Utility Corridor, near the southwest corner of the West Containment Cell. Samples were collected at one-foot intervals to a depth of 5 feet. Evidence of visual contamination was noted at the base of the borings and total PCB concentrations from these borings ranged from 20 to 180 mg/kg (SulTRAC 2011b).

The existing soil data in or adjacent to the West Utility Corridor are not sufficient to define the nature and extent of PCB impacts. A preliminary design investigation of the West Utility Corridor will need to be performed to evaluate the PCB levels in the surface and subsurface soil. Based on historical drawings, the invert elevation of the sewerline in the vicinity of the ODC area is approximately 15 to 20 feet bgs. The preliminary design investigation will consist of collecting soil samples from borings along the corridor that will be spaced at about 50-foot intervals, consistent with the confirmation sample spacing used in the soil RA. The boring locations will be setback from the sewerline to prevent damage to the aging line. The amount of the setback will be discussed and cleared with the North Shore Sanitary District prior to installation. Two samples will be collected from at each boring and will include a surface soil sample and a sample from about mid-depth of the sewer. In borings adjacent to the ODC area, borings will be advanced to the till, and a sample will be collected from the interval above the till. The samples will be submitted to a laboratory and analyzed for PCBs.

1.6 Contaminant Fate and Transport

The primary contaminant release and transport mechanisms occurring at the OMC Plant 2 Site include the following:

- Leaching of PCBs from contaminated soil and DNAPL source materials into groundwater and subsequent dissolved phase transport in groundwater is considered a potential transport mechanism occurring at the site. Although PCBs do not readily dissolve, previous investigations have identified PCB impacts in the groundwater within the site. Migration of PCBs in groundwater is strongly retarded, resulting in very slow migration velocities. The evaluation of PCB migration in groundwater in the RI estimated a travel time of over 1,500 years for the

PCBs to migrate 50 feet. The slow migration is evidenced by PCBs only being detected in the monitoring well in the immediate vicinity of the PCB DNAPL and not in the monitoring well about 100 feet downgradient.

- Because the remaining PCB impacts are limited to subsurface soils with a temporary cover, the potential for transport of contaminated soils into offsite surface waters by erosion and surface flow is low.

1.7 Human Health Risk Assessment

A human health risk assessment was prepared during the RI in 2006 using conservative assumptions and feasible exposure pathways that were based on the site conditions and existing and potential future site use. Use of these conservative assumptions (consistent with a reasonable maximum exposure scenario) was intended to overstate rather than understate the potential risks. The results indicated several chemicals of potential concern, but PCBs in soil and groundwater are the only chemicals of potential concern remaining after the implementation of the RA in 2010 and 2011.

1.8 Ecological Risk Assessment

The ecological risk assessment was prepared during the RI in 2006 to evaluate whether contaminants present at the site and surrounding areas represent a potential risk to exposed ecological receptors. The ecological risk assessment concluded that following USEPA's proposed removal activities, risks to the ecological receptors would be considered acceptable, and no further investigation would be required. After the RA in 2010 and 2011, the remaining impacts exceeding cleanup criteria were limited to subsurface soil that does not pose an exposure potential for ecological receptors.

SECTION 2

Development and Identification of ARARs, RAOs, and PRGs

2.1 Summary of Applicable or Relevant and Appropriate Requirements

Remedial actions must be protective of public health and the environment. Section 121 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requires that primary consideration be given to remedial alternatives that attain or exceed ARARs. The purpose of this requirement is to make CERCLA response actions consistent with other pertinent federal and state environmental requirements, as well as to adequately protect public health and the environment.

The following are definitions of the ARARs and the "to be considered" (TBC) criteria:

- Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that directly and fully address a hazardous substance, pollutant, contaminant, environmental action, location, or other circumstance at a CERCLA site.

- Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law, which while not applicable, address problems or situations sufficiently similar (relevant) to those encountered at a CERCLA site, that their use is well suited (appropriate) to the particular site.

- TBC criteria are non-promulgated, non-enforceable guidelines or criteria that may be useful for developing a remedial action, or are necessary for evaluating what is protective to human health and/or the environment. Examples of TBC criteria include IEPA tiered approach to corrective action objectives (TACO) Tier 1 remediation objectives, USEPA drinking water health advisories, reference doses, and cancer slope factors.

Another factor in determining which requirements must be addressed is whether the requirement is substantive or administrative. Onsite CERCLA response actions must comply with the substantive requirements but not with the administrative requirements of environmental laws and regulations as specified in the NCP, 40 *Code of Federal Regulations* (CFR) 300.5, definitions of ARARs, and as discussed in 55 Federal Register 8756. Substantive requirements are those pertaining directly to actions or conditions in the environment. Administrative requirements are mechanisms that facilitate the implementation of the substantive requirements of an environmental law or regulation. In general, administrative requirements prescribe methods and procedures (for example, fees, permitting, inspection, and reporting requirements) by which substantive requirements are made effective for the purposes of a particular environmental or public health program.

ARARs are grouped into three types: chemical-specific, location-specific, and action-specific. Appendix A includes the chemical-specific, action-specific, and location-specific ARARs for the OMC Plant 2 Site. The most important ARARs are discussed in the following subsections. All potential ARARs are listed in Appendix A along with an analysis of the ARAR status relative to remediation of the OMC Plant 2 Site.

2.1.1 Chemical-specific ARARs

Chemical-specific ARARs include laws and requirements that establish health- or risk-based numerical values or methodologies for environmental contaminant concentrations or discharge. The primary chemical-specific ARARs for the OMC Plant 2 Site are TSCA. TSCA is applicable to remedial actions managing soils contaminated with PCBs and establishes the requirements and thresholds for their management. TSCA is discussed further in action-specific ARARS.

2.1.2 Action-specific ARARs

Action-specific ARARs regulate the specific type of action or technology under consideration, or the management of regulated materials. The most important action-specific ARARs that may affect the RAOs and the development of remedial action alternatives are CERCLA, TSCA, and Resource Conservation and Recovery Act (RCRA) regulations.

2.1.2.1 Comprehensive Environmental Response, Compensation, and Liability Act

CERCLA requires the selected remedy to meet the substantive requirements of all environmental rules and regulations that are ARARs unless a specific waiver of the requirement is granted. Waiver of ARARs may be requested (per NCP 300.430(f)(1)(ii)(C)) based on any one of six circumstances. It is not anticipated that any ARAR waivers under CERCLA will be necessary.

2.1.2.2 Toxic Substances Control Act

TSCA regulates the remediation of soils contaminated with PCBs under 40 CFR 761.61. If excavated for disposal, it requires soil contaminated with PCBs at concentrations of 50 mg/kg or greater to be disposed of at either a hazardous waste landfill permitted under RCRA or at a chemical waste landfill permitted under TSCA.

The self-implementing requirements for onsite cleanup of PCB remediation waste under 40 CFR 761.61 are not ARARs for CERCLA sites but are considered TBCs. Remediation of soils to 1 mg/kg total PCB is the cleanup level for high-occupancy areas under TSCA and is generally used for CERCLA remediation of soils.

2.1.2.3 Resource Conservation and Recovery Act

RCRA regulations governing the identification, management, treatment, storage, and disposal of solid and hazardous waste would be ARARs for alternatives that generate waste that would be moved to a location outside the area of contamination. Such alternatives could include excavation of materials. Requirements include waste accumulation, record keeping, container storage, disposal, manifesting, transportation, and disposal.

Portions of the soil at the OMC Plant 2 Site may be characteristic hazardous waste. If the soil is characteristic hazardous waste, RCRA land disposal restrictions would apply, and treatment would be required in accordance with RCRA prior to disposal. This includes treatment of other underlying hazardous constituents as required by 40 CFR 268.9(a). The most likely land disposal restriction that would have to be met is the characteristic hazardous waste soil would have to be treated to 60 mg/kg trichloroethene or 100 mg/kg PCB prior to disposal in a RCRA Subtitle C landfill. If the soil has no other underlying hazardous constituents, it could be treated to below the toxicity characteristic leaching procedure limit, rendering it nonhazardous, and disposed in a Subtitle D landfill. Nonhazardous waste soil would be disposed in accordance with RCRA solid waste disposal requirements.

2.1.3 Location-specific ARARs

Location-specific ARARs are requirements that relate to the geographical position of the site. State and federal laws and regulations that apply to the protection of wetlands, construction in floodplains, and protection of endangered species in streams or rivers are examples of location-specific ARARs. The most important location-specific ARARs for the OMC Plant 2 Site are the following:

- **Coastal Zone Management Act**—This requires that activities directly affecting the coastal zone be conducted in a manner that is consistent, to the maximum extent practicable, with approved state coastal zone management programs.

- **Executive Orders 11988 (Floodplain Management) and 11990 (Protection of Wetlands), 50 CFR § 6 Appendix A**—These are TBCs. They set forth USEPA policy for carrying out the provisions of Executive Orders (EOs) 11988 and 11990. EO 11988 requires that actions be taken to reduce the risk of flood loss; to minimize the impact of floods on human safety, health, and welfare; and to restore and preserve the natural and beneficial values served by floodplains. EO 11990 requires that actions at the site be conducted in ways that minimize the destruction, loss, or degradation of wetlands. Small wetland areas are present along the North and South ditches between the OMC Site and Lake Michigan.

2.2 Remedial Action Objectives

USEPA's *Guidance on Remedial Actions for Contaminated Groundwater at Superfund Sites* (USEPA 1988a) and the NCP define RAOs as medium-specific or site-specific goals for protecting human health and the environment that are established on the basis of the nature and extent of the contamination, the resources that are currently and potentially threatened, and the potential for human and environmental exposure. PRGs are site-specific, quantitative goals that define the extent of cleanup required to achieve the RAOs. These PRGs are developed and used in the FS, and they will be finalized in the ROD for the OMC Plant 2 Site.

There is a potential for unacceptable risks from exposure to onsite soil by construction workers. The exposure is limited to construction workers because the remaining soils with elevated PCB concentrations are limited to saturated subsurface soils, which also eliminates the potential exposure to ecological receptors.

The RAOs for subsurface soil at the OMC Plant 2 Site include the following:

- Prevention of construction worker human exposure, through contact, ingestion, or inhalation of contaminated soil that presents an excess lifetime cancer risk (ELCR) greater than 1×10^{-4} to 1×10^{-6}.
- Remediation of soil and groundwater to the extent practicable to minimize migration of contaminants in groundwater.

2.3 Preliminary Remediation Goals

To meet the RAOs defined in Section 2.2, PRGs were developed to define the extent of contaminated media requiring RA. Section 2.3 presents the PRGs and defines the volumes of affected media exceeding the PRGs that will be addressed in the FS process. In general, PRGs establish media-specific concentrations of chemicals of concern that will pose no unacceptable risk to human health and the environment. Chemicals of concern are the list of chemicals that result in unacceptable risk based on the results of the risk assessment. The PRGs are developed considering the following:

- Risk-based concentration levels corresponding to an ELCR between 1×10^{-4} and 1×10^{-6}, a chronic health risk defined by a hazard index of 1, and/or a significant ecological risk. As discussed earlier, PRGs for ecological receptors are not needed at the OMC Site because the areas presenting potential risk have been remediated.
- Chemical-specific ARARs/TBCs including federal maximum contaminant levels for groundwater, Illinois Water Quality Standards for Class 1 groundwater, and IEPA TACO Tier 1 remedial objectives for soil and groundwater. The TACO Tier 1 remediation objectives are TBCs and are set at the hazard index equals 1 and ELCR values at 1×10^{-6}. The ELCR values could be modified upward to represent the values corresponding to a cumulative risk of 1×10^{-4}.

A summary of the PRGs for soil exposure pathways at the OMC Plant 2 Site are included in Table 2-1. The regulations and action levels are presented in Appendix A.

TABLE 2-1
Soil Preliminary Remediation Goals
OMC Plant 2

	USEPA Mid-Atlantic Risk Assessment Regional Screening Level			TACO Tier 1	
Contaminant	Residential Soil (mg/kg)	Industrial Soil (mg/kg)	Risk-based Soil Screening Level for Protection of Groundwater (mg/kg)	Residential Soil Ingestion (mg/kg)	Construction Worker Soil Value Ingestion (mg/kg)
PCB 1232 (Aroclor 1232)	0.14	0.54	0.000074	1	1
PCB 1242 (Aroclor 1242)	0.22	0.74	0.0053	1	1
PCB 1248 (Aroclor 1248)	0.22	0.74	0.0052	1	1
PCB 1254 (Aroclor 1254)	0.22	0.74	0.0088	1	1
PCB 1260 (Aroclor 1260)	0.22	0.74	0.024	1	1

Selected PRG highlighted in bold with shaded background.
USEPA soil screening levels correspond to a 10^{-6} risk level (November 2011)
Illinois Water Quality Standard – Groundwater Class I – Illinois Administrative Code Title 35: Environmental Protection, Subtitle F: Public Water Supplies, Chapter I: Pollution Control Board, Part 620 Groundwater Quality, Section 620.410 Groundwater Quality Standards For Class I: Potable Resource (Illinois Administrative Code 2002)
TACO – Tier 1 Groundwater Remediation Objectives for the Groundwater Component of the Groundwater Ingestion Route – Appendix B, Tables A&B (IEPA 2007)

Based on the potential future exposure risks and the RAOs presented in Section 2.2, soil PRGs were developed for subsurface soil for construction worker exposure. PRGs were not developed at this time to address the RAO to prevent leaching of soil contaminants to groundwater because there are no TACO Tier 1 criteria for the soil component of the groundwater ingestion exposure route.

Soil PRGs for PCBs and for each of the above pathways are presented in Table 2-1. PRGs developed for construction worker protection from direct contact ingestion and inhalation exposures were applied to all subsurface soil. The unsaturated zone soil (generally less than 5 feet deep) has been previously excavated during the RA. Confirmation sampling indicated soils in the saturated zone had highly elevated PCB concentrations that are the focus of this report.

A summary of the PRGs for groundwater exposure pathways at the OMC Plant 2 Site are included in Table 2-2. The regulations and action levels are presented in Appendix A.

TABLE 2-2
Groundwater Preliminary Remediation Goals
OMC Plant 2

Contaminant	Federal Safe Drinking Water Act Maximum Contaminant Level (mg/L)	USEPA Regional Screening Levels Tap Water (mg/L)	Illinois Water Quality Standard-Groundwater Class I (mg/L)	Illinois TACO Tier 1 Groundwater Class I (mg/L)
PCB 1016 (Aroclor 1016)	0.0005	0.00096	0.0005	**0.0005**
PCB 1232 (Aroclor 1232)	0.0005	0.0000043	0.0005	**0.0005**
PCB 1248 (Aroclor 1248)	0.0005	0.000034	0.0005	**0.0005**
PCB 1254 (Aroclor 1254)	0.0005	0.000034	0.0005	**0.0005**

Selected PRG highlighted in bold with shaded background.
USEPA Regional Screening Levels correspond to a 10^{-6} risk level (November 2011)
Illinois Water Quality Standard – Groundwater Class I – Illinois Administrative Code Title 35: Environmental Protection, Subtitle F: Public Water Supplies, Chapter I: Pollution Control Board, Part 620 Groundwater Quality, Section 620.410 Groundwater Quality Standards For Class I: Potable Resource (Illinois Administrative Code 2002)
TACO – Tier 1 Groundwater Remediation Objectives for the Groundwater Component of the Groundwater Ingestion Route – Appendix B, Table E (IEPA 2007)
mg/L = milligrams per liter

2.4 Contaminated Media Exceeding PRGs

The data generated during the soil excavation and demolition RA, were examined to determine the areas and depths of soil and groundwater that exceed the PRGs. The following subsections discusses the media exceeding the PRGs.

2.4.1 Soil

Recent data indicate that PCB-contaminated soils exceeding the PRGs remain in following areas:

- **ODC Area and PCB DNAPL Area.** The RA contractor excavated and removed the PCB-contaminated soil to a few feet below the water table and stabilized the excavation with slightly PCB-contaminated (2 to 8 mg/kg) crushed concrete derived from other areas of the site. Confirmation sampling conducted at the base of the excavations in this area range from 30.5 to 11,700 mg/kg. The depth of the contamination has not been defined. The extent of the contaminated area is estimated to be 5 acres, which includes the area under the building footprint and the PCB DNAPL area surrounding MW517D, along with a buffer around the perimeter to account for some limited PCB migration.

- **The West Utility Corridor adjacent to the railroad tracks.** This area contains an aging, 51-inch-diameter sewerline connecting nearby suburbs to the North Shore Sanitary District treatment plant. PCB concentrations were detected in the soils during limited previous investigations in the area. An additional preliminary design investigation is required to delineate the PCB impacts. The results of the preliminary design investigation will be used to evaluate engineering or institutional controls that may be required for the area. However, the existence and fragile nature of the sewer pipe makes excavation or other invasive technologies unfeasible to achieve PCB cleanup goals in this area.

- **The North Utility Corridor adjacent to North Ditch (designated as Area 4).** A 12-inch-diameter, high-pressure gas main is located in Area 4 making excavation of the contaminated soil to achieve cleanup goals unfeasible. Confirmation soil samples collected from the based and side walls of the excavation ranged from 1.01 to 2,410 mg/kg total PCBs.

Because implementing possible actions to address the PCB-impacted soils in the utility corridor and around the high-pressure gas main is not feasible, multiple alternatives for these areas will not be developed in this report. The PCB-impacted soils in these areas will be managed in place using a soil management plan and institutional controls. This FS report, however, focuses on the development and evaluation of potential technologies and alternatives for soils in the ODC Area and PCB DNAPL in the vicinity of MW 517D.

2.4.2 Groundwater

Although PCBs do not readily dissolve in groundwater, low levels of PCB were detected in the two monitoring wells constructed in the vicinity of the PCB DNAPL. The 2005 groundwater data reported 61 µg/L of Aroclor 1248 and 110 µg/L of Aroclor 1232 in samples from the shallow (MW-517S) and deep (MW-517D) wells, respectively. The PCB concentrations in the wells exceed the PRGs for PCBs in groundwater. PCBs were not detected in any of the other monitoring wells across the site and are not anticipated outside of the potential PCB source areas based on the slow migration velocities of PCBs in groundwater (0.03 foot per year). The area with PCB-contaminated groundwater will be included with the ODC and PCB DNAPL areas.

SECTION 3

Identification and Screening of Technologies

After the RAOs and PRGs were developed, general response actions consistent with the objectives were identified; general response actions are basic actions that might be undertaken to remediate a site (for example, no action, in situ treatment, or excavation and treatment). For each general response action, several possible remedial technologies may exist. They can be further broken down into a number of process options. The technologies and process options are then screened based on several criteria. Those technologies and process options remaining after screening are assembled into alternatives in Section 4.

The following sections present general response actions that may be applicable to PCB-contaminated subsurface soils at the OMC Plant 2 Site.

3.1 General Response Actions

The general response actions for the OMC Plant 2 Site include the following:

- No further action
- Institutional controls
- Containment
- In situ treatment
- Excavation and disposal

Each general response action is discussed in the following subsections along with an overview of some of the technologies that are representative of the response action.

3.1.1 No Further Action

The no further action response includes no action for the PCB-contaminated subsurface soils.

3.1.2 Institutional Controls

Institutional controls, such as access restrictions or a restrictive covenant on the property deed of the OMC Site limiting intrusive activities on the property, may be necessary either as a stand-alone action or in concert with other actions.

3.1.3 Containment

Containment is used to minimize the risk of contaminant migration as well as prevent direct contact exposures. Surface controls such as grading and vegetating can be used to reduce infiltration of precipitation through contaminated soil and prevent further erosion and offsite transport of contaminated soil. Capping and subsurface barriers are two applicable remedial technologies that could also be used at OMC to limit exposure to contaminants, help prevent contaminant migration, and limit the infiltration of precipitation.

3.1.4 In Situ Treatment

In situ treatment methods can be used to reduce the contaminant concentrations in soil. In situ methods that may be applicable to the subsurface soil include in situ soil mixing with a variety of reagents. Several reagents are considered in screening. However, the location of contaminants, the type of contaminants, and high water table significantly reduce the number of viable in situ treatments.

3.1.5 Excavation and Disposal

Excavation and disposal includes excavating the contaminated soil after installation of excavation bracing and dewatering controls and transferring it to a permitted and approved offsite disposal area suitable for deposition of PCB-impacted soils.

3.2 Identification and Screening of Technology Types

In this section, the technology options available for remediation of soil are presented and screened. An inventory of technology types and process options is presented based on professional experience, published sources, computer databases, and other available documentation for the general response actions identified in Sections 3.1, 3.2, and 3.3. Each technology type and process option is either a demonstrated, proven process, or a potential process that has undergone laboratory trials or bench-scale testing.

Each technology option is screened based on a qualitative comparison of effectiveness, implementability, and relative cost. The step may eliminate a general response action from the alternatives screening process if there are no feasible technologies identified. The objective, however, is to retain the best technology types and process options within each general response action and use them for developing remedial alternatives. The evaluation and screening of technology types and process options are presented in Table 3-1. The technologies and process options that are screened out based on effectiveness, implementability, and/or cost are highlighted in the table.

As mentioned above, technology options are screened in an evaluation process based on effectiveness, implementability, and relative cost. Effectiveness is considered the ability of the process option to perform as part of a comprehensive remedial plan to meet RAOs under the conditions and limitations present at the site. Additionally, the NCP defines effectiveness as the "degree to which an alternative reduces toxicity, mobility, or volume through treatment, minimizes residual risk, affords long-term protection, complies with ARARs, minimizes short-term impacts, and how quickly it achieves protection." This is a relative measure for comparison of process options that perform the same or similar functions. Implementability refers to the relative degree of difficulty anticipated in implementing a particular process option under regulatory, technical, and schedule constraints posed by the OMC site. At this point, the cost criterion is comparative only, and similar to the effectiveness criterion, it is used to preclude further evaluation of process options that are very costly if there are other choices that perform similar functions with similar effectiveness. The cost criterion includes costs of construction and any long-term costs to operate and maintain technologies that are part of an alternative.

The NCP preference is for solutions that use treatment technologies to permanently reduce the toxicity, mobility, or volume of hazardous substances. Available treatment processes are typically divided into three technology types: physical/chemical, biological, and thermal, which are applied in one or more general response actions with varying results.

The technology types and process options remaining following screening and identified in the following sections are subject to refinement/revision based on further investigation findings, results of treatability studies, or recent technological developments.

3.3 Technology and Process Option Screening

Using the same methodology described in the preceding sections, Table 3-1 presents the screening of technology types and process options available. Potentially feasible technologies and process options for each general response action at the OMC Plant 2 Site include the following:

- No further action
- Institutional controls: deed restrictions, permits, and monitoring
- Containment
- In situ treatment
- Excavation and disposal

The rationale for selecting the process options is explained in Table 3-3. The following subsections highlight technologies where more detailed evaluation was necessary to distinguish between technologies.

3.3.1 Containment

Containment alternatives were considered as part of the evaluation process. Surface containment alternatives include asphalt and soil capping to eliminate exposure to contaminated soils, limit the infiltration of precipitation,

and help prevent contaminant migration offsite. Surface controls such as grading can be used to reduce infiltration of precipitation through contaminated residue and prevent erosion and offsite transport of contaminated residue.

Evaluated vertical containment alternatives include hydraulic gradient control, sheet piling, and slurry walls. The findings of the RI indicate groundwater contamination from the OMC Site is not discharging to Lake Michigan east of the site. In addition, groundwater analytical results indicate groundwater contamination related to the OMC site is not discharging to Waukegan Harbor.

3.3.2 In Situ Soil Mixing/In Situ Treatment

The soil mixing response action, if implemented, would combine a stabilizing amendment such as bentonite clay or encapsulating reagent such as Portland cement or cement kiln dust. Soil mixing would use large-diameter augers to mix the amendments with the PCBs and native soils. The cost of soil mixing is moderate due to the specialized equipment required to mix soil at a depth of 25 feet bgs and primarily affected by the volume of the area to be mixed.

3.3.3 Excavation and Disposal

PCB soils exceeding PRGs will be excavated and disposed offsite at an approved-TSCA landfill. This would require a large deep excavation extending below the water table. The depth of the PCB contamination, excavation support, and groundwater control would need to be assessed further to determine the suitability of this option.

Offsite disposal at a landfill would involve excavation and transportation of the soil to an appropriately permitted facility. There are Subtitle D and Subtitle C landfills in Illinois and some adjoining states in relative proximity to the OMC Site.

Disposal was retained as an option because of the availability of disposal facilities, and minimal O&M costs upon completion of the remedy.

TABLE 3-1
Remedial Technology Screening
OMC Plant 2

Remedial Technology	Process Options	Descriptions	Effectiveness	Implementability	Relative Cost Range	Screening Comment
No Action						
None	None	No action	None	Implementable	Zero	Required for comparison.
Institutional Controls						
Access and Use Restrictions	Deed restrictions	Deed restrictions issued for property, source area groundwater exceeding the clean up goals to restrict groundwater and land use.	Good	Good	Low	Retained—Needed to ensure groundwater is not used until PRGs are attained.
	Permits	Regulations promulgated to require a permit for various activities (i.e., installation of wells, etc.).	Good	Good	Low	Retained
Monitoring		Short-and/or long-term routine monitoring is implemented to record site conditions, concentration levels, and natural attenuation parameters.				Critical to monitor effectiveness of any action.
Containment						
Surface Controls	Grading	Reshape topography to control infiltration, runoff, and erosion.	Good	Good	Low	Not retained due to current site conditions.
	Soil Cover	Place soil cover over impacted area; includes a topsoil cover layer to protect soil.	Good	Good	Moderate	Not Retained
	Capping–Clay	Place clay over impacted area; includes a cover layer to protect clay.	High	Good	Moderate	Retained
	Capping–Asphalt	Place asphalt or concrete over impacted area.	Good	Good	High	Not retained due to cost.
	Capping Geosynthetic Liner	Place geomembrane or synthetic material over impacted area; includes a protective cover layer.	Good	Good	High	Retained for comparison to clay capping costs.
Vertical Barriers	Slurry walls	A one-pass trencher would construct in-place a hydraulic barrier (slurry wall).	Very effective for sites where containment of contaminant plumes threatening down gradient receptors is the primary remedial objective.	Good—One-Pass slurry walls are a newer technology for construction of the slurry wall in-place without the need for an excavation reducing construction duration and cost.	Moderate—Costs are dependent on subsurface conditions, primarily the strength of the glacial till.	Retained
	Grout Curtains	Grout pressure injected along contamination boundaries in a regular overlapping pattern of drilled holes.	Continuity of wall is difficult to assess and leakage may occur.	Good—shallow depth to confining unit reduces potential for complications.	High	Not retained
	Sheet piling	Interlocking steel piles are driven into subsurface along the boundaries of the impacted area. Sheet piling would be used as temporary shoring for soil excavation.	Very effective for temporary shoring of soil during excavation. Sealable sheet piles are also effective for limiting groundwater migration.	Implementable to depths of about 30 feet needed at site.	High	Retained for comparison to slurry wall costing.
	Permeability reduction agents	Cement grout or organic polymer injected into the soil matrix to reduce permeability.	Experimental process option	Good in the shallow portion of the aquifer and moderate in the low portion of the aquifer where permeability is reduced.	Moderate	Not retained for containment of groundwater.
	Ground freezing (Cryocell process)	Ground freezing technology is used to form a flow-impervious, removable, and fully monitored ice barrier that circumscribes the contaminant source in situ.	Short-term effectiveness has been reported.	Requires piping installation, limited inflow of warm water, low groundwater velocity is best.	High—High capital costs and high O&M costs.	Not retained due to cost.
	Ground freezing	Similar to vertical barriers by ground freezing.	Experimental process option	Moderate	High	Not retained
	Liners	Liners placed to restrict vertical flow can be constructed of the same material is considered for cap construction.	Good	Poor	Moderate	Not retained due to construction constraints.

TABLE 3-1
Remedial Technology Screening
OMC Plant 2

Remedial Technology	Process Options	Descriptions	Effectiveness	Implementability	Relative Cost Range	Screening Comment
Hydraulic	Vertical wells	Conventional groundwater extraction is pumping in vertical wells. Other extraction device include vacuum enhanced recovery, jet-pumping systems, etc.	Widely used and demonstrated effectiveness. Generally effective for hydraulic containment (i.e., horizontal migration) and ineffective for groundwater restoration.	Good. Common technology; often combined with other treatment technologies applied to the extracted groundwater in an integrated system.	Considered moderately cost-effective; good cost-effectiveness at lower permeability sites.	Retained. Required for use in conjunction with vertical walls to control an inward hydraulic gradient.
	Horizontal wells	Drilling techniques are used to position wells horizontally, or at an angle, to reach contaminants not accessible by direct vertical drilling.	Widely used and demonstrated effectiveness. Increasingly applied technology for increasing production rate from low permeability sites, or to access areas inaccessible with vertical well technology.	Requires sufficient area at one end of well for equipment and angled penetration. Often combined with other treatment technologies applied to the extracted groundwater in an integrated system.	Significantly higher than vertical wells.	Not retained due to constructability and O&M.
In Situ Treatment/Soil Mixing						
Biological	Natural attenuation	Short- and/or long-term routine monitoring is implemented to record site conditions, concentration levels, and natural attenuation parameters. Natural subsurface processes such as dilution, volatilization, biodegradation, adsorption, and chemical reactions with subsurface materials are allowed to reduce concentrations to acceptable levels.	Poor. Natural attenuation not effective for PCBs.	Poor regulatory agency acceptance.	Generally, the lowest cost alternative was applicable. The most significant costs associated with natural attenuation are most often due to monitoring requirements.	Not retained for further evaluation.
	In situ soil mixing	Use of large-diameter augers to physically disturb the subsurface, with the introduction of permeability reducing agents, hot air, steam, peroxide, or other fluids to promote contaminant containment, removal or destruction. Soil mixing can be combined with many variations for solidification/stabilization.	Good. Addition of cement, cement kiln dust or bentonite can encapsulate the PCBs in the soil.	Implementable	High	Retained
Removal						
Excavation	Excavation	Excavation of PCB impacted soils can use ordinary construction equipment backhoes, bulldozers, and front-end loaders. Excavation of PCB soils down to the glacial till would require significant excavation bracing and shoring.	Very effective because limits of contamination can be observed during excavation.	Excavation combined with offsite treatment and disposal of PCB soil is well proven and readily implementable technology.	High costs for deep excavation.	Retained for comparison purposes.
Landfill	TSCA or RCRA Subtitle C Landfill	Solid hazardous wastes are permanently disposed of in a RCRA-permitted landfill.	Good.	There are suitable landfills within relative proximity of the site.	High. Variable but expected to be about $200/ton.	Retained for comparison purposes.
	Subtitle D Solid Waste Landfill	Solid nonhazardous wastes are permanently disposed of in a non-RCRA landfill.	Good.	There are suitable landfills within relative proximity of the site.	Moderate. Disposal costs typically range from $20 to $50/ton.	Retained for comparison purposes.

Note:
Highlighted technologies are screened from further consideration in the assembly of remedial action alternatives.
Effectiveness is the ability to perform as part of an overall alternative that can meet the objective under conditions and limitations that exist onsite.
Implementability is the likelihood that the process could be implemented as part of the remedial action plan under the physical, regulatory, technical, and schedule constraints.
Relative cost is for comparative purposes only and it is judged relative to the other processes and technologies that perform similar functions.

SECTION 4

Alternative Descriptions

The remedial technologies and process options that remain after screening were assembled into a range of alternatives. The specific details of the remedial components discussed for each alternative are intended to serve as representative examples to allow order-of-magnitude cost estimates. Other viable options within the same remedial technology that achieve the same objectives may be evaluated during remedial design activities for the site. The following subsections provide a detailed description of each alternative. The developed remedial alternatives are summarized in Table 4-1.

TABLE 4-1
Remedial Alternative Development
OMC Plant 2

General Response Actions	Remedial Technology/Process Option	1—No Further Action	2—IEPA 807 or 811 Cap and Institutional Controls	3—IEPA 807 or 811 Cap, Vertical Barrier and Institutional Controls	4—In Situ Treatment and Institutional Controls	5—Excavation and Disposal and Institutional Controls
No Action	None	X				
Institutional Controls	Deed restrictions		X	X	X	X
	Monitoring		X	X	X	
Containment	Capping		X	X		
	Vertical Barrier—Slurry Wall			X		
	Vertical Barrier—Sheet Pile Wall			X		
Collection	Vertical wells			X		
In Situ Treatment	Soil Mixing				X	
Disposal	Excavation					X
	TSCA/RCRA Subtitle C Landfill					X
	Subtitle D Landfill					X

Cost estimates with an accuracy of +50 to -30 percent, consistent with FS-level of estimation, were prepared for the remedial alternatives shown in Table 4-1. The cost estimates are provided in Appendix B and are briefly discussed with the respective alternative descriptions.

4.1 Alternative 1—No Further Action

The objective of Alternative 1, the No Further Action Alternative, is to provide a baseline for comparison to other alternatives, as required by the NCP. Alternative 1 does not include any further remedial action for soil. It does not include monitoring or institutional controls, but includes costs for 5-year reviews.

4.2 Alternative 2—Illinois Administrative Code 807 or 811 Cap, Institutional Controls and Monitoring

Figure 7 shows the components of Alternative 2, including the extent of the cap and areas proposed for institutional controls.

4.2.1 Institutional Controls and Monitoring

Deed notices and restrictive covenants would be added to the property's deed to notify future property owners that the soil present at the site pose risks to human health and the environment. Measures would be taken to ensure that land-use restrictions would be maintained through future property transfers and acquisitions.

The restrictive covenant that prevents use of onsite groundwater would also be maintained, and additional institutional controls would be included to control excavation and disposal of PCB-contaminated soils. It is anticipated that the institutional controls will be similar to those employed at the WCP Site. The following are examples of institutional controls that have been, or will be, employed at the WCP Site:

- A Notice of Land Use Restrictions and Institutional Controls (Notice) will be recorded with the Lake County Recorder of Deeds.
- Land use approval from the city and agreements for development will contain conditions requiring compliance with the ROD and soil management plan and maintenance of engineered barriers, such as caps or covers. The city will provide notice of restrictions.
- An ordinance will be enacted by the city to prohibit the use of groundwater as potable water supply and mandating the supply of potable water through the city's municipal water distribution system.

The specific institutional controls for the OMC Plant 2 Site will be specified in a soil management plan. The soil management plan will also present the requirements for handling soil materials and for conducting subsurface activities at the site.

The North Utility Corridor adjacent to the North Ditch (Area 4) and the West Utility Corridor both contain active utilities that may require periodic repairs, upgrades or other activities. Because it may not be possible to implement deed notices or restrictive covenants for these areas, notifications will be placed in the city and the Illinois One-Call System databases to alert workers of potential hazards of conducting subsurface activities in these areas. In addition, Nicor and the North Shore Sanitary District will be notified of the estimated extent of impacted soils in their respective right-of-ways/easements for incorporation into their worker notification systems (as possible). The preliminary design investigation in the West Utility Corridor will determine the type of institutional controls required for this area, if necessary. If the preliminary design investigation identifies surface soil impacts, institutional controls or engineering controls, such as a cover, may be required to prevent direct contact with soils. If the preliminary design investigation identifies subsurface soil impacts, institutional controls may be required for protection of construction workers. The soil management plan will identify the requirements for each area.

Groundwater downgradient of the PCB-contaminated soil areas and surface water from the North Ditch would be monitored to verify that the PCBs are not being transported from the potential source areas. Monitoring wells would be installed and groundwater and surface water would be sampled semiannually for the first 2 years following implementation of the RA. Results would be evaluated and compared against PRGs. Pending analytical results, the monitoring may be reduced to annual sampling. The groundwater and surface water monitoring will be included as part of the long-term monitoring program developed for the OMC Plant 2 Site.

An annual monitoring report would be prepared documenting analytical results, site inspections and trend analyses, and recommendations for proposed changes in the scope and frequency of the monitoring program, if appropriate. Alternative 2 assumes that four monitoring wells and two surface water locations within the North Ditch would be sampled and analyzed for PCBs.

4.2.2 Illinois Administrative Code 807 Cap

The existing topography within the ODC area would be graded to minimize erosion and to promote surface water runoff by building up grades with imported clean fill, and covered with clay and topsoil.

The remedial component of the cap over the site soils would be to restrict access to the subsurface PCB-contaminated and to minimize infiltration through the contaminated soils. The area to be covered is

approximately 5 acres. The specific location and dimensions of the cap area will be determined during the design and would be consistent with future site development.

The cap area would first be re-graded to establish the required design slopes (assumed to be 2 to 5 percent slopes, though steeper slopes may be necessary). The final slopes of the cap would be designed to promote runoff while minimizing the potential for erosion. The specific soil type for the cap would be evaluated during the design, but for cost estimating purposes, it is assumed that the cap soil would consist of 24 inches of low-permeability clay and 6 inches of topsoil. The cap would be vegetated to minimize infiltration and erosion. The cap would prevent direct contact, eliminate erosion, and reduce infiltration through the contaminated soils.

4.2.3 Illinois Administrative Code 811 Cap

The Illinois Administrative Code (IAC) 811 cap may be applicable to Alternatives 2 and 3, in lieu of the IAC 807 cap. The IAC 811 cap has the same lateral extent as the IAC 807 cap. The specific cap cross section would be selected in design, but for costing purposes it is assumed that the cap cross section would include (top to bottom) 0.5 foot of topsoil, 3 feet of soil for freeze-thaw protection, double-sided geocomposite, 40-mil linear low-density polyethylene geomembrane, and 2 feet of low-permeability clay soil or a geosynthetic clay liner. The cap would be vegetated. The assumed required design would be 2 to 5 percent slopes but would be determined during the design. The cap would prevent direct contact and eliminate erosion and infiltration, thus reducing the exceedance of surface water and sediment standards.

4.3 Alternative 3—Illinois Administrative Code 807 or 811 Cap, Vertical Barrier, Institutional Controls, and Monitoring

Figure 8 shows the components of Alternative 3, including the extent of the cap, location of the vertical barrier, and areas proposed for institutional controls.

4.3.1 Institutional Controls and Monitoring

The Alternative 3 institutional controls and monitoring are the same as those for Alternative 2.

4.3.2 Illinois Administrative Code 807 or 811 Cap

The Alternative 3 IAC 807 or 811 cap is the same as that for Alternative 2.

4.3.3 Vertical Barrier Wall

Alternative 3 will include a vertical barrier (sheet pile or slurry wall) that would extend from the ground surface and be keyed a minimum of 3 feet into the glacial till layer resulting in a total wall depth of 28 feet. The vertical barrier would be placed around the perimeter of the ODC area for approximately 2,400 linear feet. The IAC 807 or 811 cap will then extend beyond the limits of the vertical barrier fully encapsulating the contaminated soils.

A limited amount of infiltration is expected to occur through the IAC 807 cap and through the vertical barrier walls. The IAC 811 cap is not anticipated to allow any infiltration through the cap due to the impermeable geomembrane. It is assumed that two stainless steel vertical extraction wells would be placed at the peak elevations of the IAC 807 or 811 cap for controlling the groundwater level within the vertical barrier. The extraction wells would discharge to the existing PCB treatment system for the West Containment Cell located just north of the ODC area. The extraction wells would pump at a rate sufficient to draw down the water within the vertical barrier walls creating an inward gradient. Water level monitoring would be performed to evaluate the gradient during operation. The depth to water would be measured in pairs of piezometers located on the inside and outside of the vertical barrier walls. The water table elevation would then be calculated inside and outside the vertical barrier to determine the gradient.

It is anticipated that the same extraction well and piezometer design would be required for the IAC 807 and 811 caps, and the pumping rates would be adjusted accordingly to accommodate the infiltration rates for each cap. If selected, evaluation of the upgrades required to the existing PCB treatment system for the West Containment Cell would be performed during the remedial design.

4.4 Alternative 4—In Situ Treatment, Institutional Controls, and Monitoring

Figure 9 illustrates the preliminary area for in situ treatment and areas proposed for institutional controls.

4.4.1 Institutional Controls and Monitoring

The Alternative 4 institutional controls and monitoring are the same as those for Alternative 2.

4.4.2 In Situ Treatment

The objective of Alternative 4 is to incorporate amendments by soil mixing to encapsulate the PCB-contaminated soils. The encapsulation of the soils prevents groundwater flow through the treated area by creating a solid mass with very low permeability. The amendments (or reagents) may include bentonite, Portland cement, and cement kiln dust. Bentonite would be added to reduce the torque needed to rotate the augers during soil mixing. In addition, it would reduce the permeability of the mixed soil so that the mass flux from the untreated residuals is greatly reduced. The solidified material would be covered with 6 inches of soil to establish a vegetative cover and to reduce potential for an exposed surface that could be subject to weathering.

Portland cement or cement kiln dust may be added to encapsulate the contaminated soils. Both amendments would be mixed with the PCB-contaminated soils to solidify the soils between the ground surface down to the glacial till. Large-diameter (6 feet or greater) augers would be advanced to the target depth. Upon reaching the target depth, the amendments would be injected through the augers. The augers would be advanced and retracted through the soil interval several times to ensure complete mixing. This process would be repeated in overlapping columns until the entire area had been treated.

Prior to implementation of this alternative, a preliminary design investigation would need to be conducted to delineate the horizontal and vertical extent of the treatment area. For the purposes of the FS, the assumed area for in situ treatment is estimated to be 5 acres, and the total treatment depth is 25 feet based on the average depth to till. In addition, an appropriate study shall be performed to determine the most suitable amendment and mix for achieving the RAOs and PRGs. The auger diameter and spacing will be determined during the design.

Quarterly groundwater sampling of eight monitoring wells at four downgradient locations will be included as part of the long-term monitoring program developed for the OMC Plant 2 Site. Groundwater samples will be analyzed for PCBs.

4.5 Alternative 5—Excavation and Disposal and Institutional Controls

Figure 10 shows the extent of excavation and backfill and areas proposed for institutional controls.

4.5.1 Institutional Controls and Monitoring

The Alternative 5 institutional controls and monitoring are the same as those for Alternative 2 in the North Utility Corridor adjacent to the North Ditch (Area 4) and West Utility Corridor. No institutional controls are required in the ODC area.

4.5.2 Excavation and Disposal

The objective of Alternative 5, excavation and offsite disposal of soils in the ODC and PCB DNAPL Area, is to prevent construction worker human exposure, through contact, ingestion, or inhalation to contaminated soil and prevention of offsite transport of soils contaminated at concentrations posing unacceptable risk. The volume of soil to be excavated would be based primarily on the presence of PCBs greater than 1 mg/kg.

Soils above the water table have already been removed as part of a previous action. Soils below the groundwater extending to the top of glacial till within the boundary of the ODC area would need to be removed. For the purposes of the FS, it is assumed that the total excavation depth is 25 feet based on the average ground surface

and glacial till elevations. The uppermost 5 feet is assumed to be clean fill placed during the remedial action in 2011 and is appropriate for reuse as backfill. The material will be excavated and managed onsite until it is placed as backfill. The total estimated volume of PCB-contaminated soil exceeding PRGs is approximately 161,334 cubic yards (yd^3). The main remedial components of this alternative include the following:

- Excavation—with sheet pile wall supporting and groundwater control measures
- Disposal

The clean backfill placed in 2011 during the remedial action would be excavated and stockpiled. Soils exceeding the PRGs would be excavated and segregated by area in separate stockpiles that would be sampled for disposal characteristics. The excavated areas would be backfilled with clean material. The stockpiles would be managed appropriately until approval for disposal was received.

Excavated soils would be managed based on the following criteria:

- Clean backfill (from above the groundwater table) would be stockpiled onsite for reuse during backfilling (40,400 yd^3).
- PCBs less than 50 mg/kg would be sent to a Subtitle D landfill (estimated 96 percent of volume exceeding PRGs or 154,880 yd^3).
- PCBs greater than 50 mg/kg would be sent to a USEPA-approved TSCA/Subtitle C landfill (estimated 4 percent of volume exceeding PRGs or 6,454 yd^3).

SECTION 5

Remedial Alternative Evaluation

The detailed analysis of alternatives presents the relevant information needed to compare the remedial alternatives for the ODC and PCB DNAPL area subsurface soils. The detailed analysis of alternatives follows the development of alternatives and precedes the selection of a remedy. The selection of the remedy is conducted by USEPA following the FS in the USEPA ROD.

Detailed analysis of alternatives consists of the following components:

- A detailed evaluation of each individual alternative against seven NCP evaluation criteria
- A comparative evaluation of alternatives to one another with respect to the seven evaluation criteria

The detailed evaluation is presented in table format. The comparative evaluation is presented in text and highlights the important factors that distinguish alternatives from each other.

5.1 Evaluation Criteria

In accordance with the NCP, remedial actions must:

- Be protective of human health and the environment
- Attain ARARs or provide grounds for invoking a waiver of ARARs that cannot be achieved
- Be cost effective
- Utilize permanent solutions and alternative treatment technologies or resource-recovery technologies to the maximum extent practicable
- Satisfy the preference for treatment that reduces toxicity, mobility, or volume (TMV) as a principal element

In addition, the NCP emphasizes long-term effectiveness and related considerations, including:

- The long-term uncertainties associated with land disposal
- The goals, objectives, and requirements of the Solid Waste Disposal Act
- The persistence, toxicity, and mobility of hazardous substances and their constituents, and their propensity to bioaccumulate
- The short- and long-term potential for adverse health effects from human exposure
- Long-term maintenance costs
- The potential for future remedial action costs if the selected remedial action fails
- The potential threat to human health and the environment associated with excavation, transportation, disposal, or containment

Provisions of the NCP require that each alternative be evaluated against nine criteria listed in 40 CFR 300.430(e)(9). The criteria were published in the March 8, 1990, *Federal Register* (55 FR 8666) to provide grounds for comparison of the relative performance of the alternatives and to identify their advantages and disadvantages. This approach is intended to provide sufficient information to adequately compare the alternatives and to select the most appropriate alternative for implementation at the site as a remedial action. The evaluation criteria include the following:

- Overall protection of human health and the environment
- Compliance with ARARs
- Long-term effectiveness and permanence

- Reduction of TMV through treatment
- Short-term effectiveness
- Implementability
- Cost
- Community acceptance
- State acceptance

The criteria are divided into three groups: threshold, balancing, and modifying criteria. Threshold criteria must be met by a particular alternative for it to be eligible for selection as a remedial action. There is little flexibility in meeting the threshold criteria—either they are met by a particular alternative, or that alternative is not considered acceptable. The two threshold criteria are overall protection of human health and the environment, and compliance with ARARs. If ARARs cannot be met, a waiver may be obtained in situations where one of the six exceptions listed in the NCP occur (see 40 CFR 300.430 (f)(1)(ii)(C)(1 to 6).

Unlike the threshold criteria, the five balancing criteria weigh the trade-offs between alternatives. A low rating on one balancing criterion can be compensated by a high rating on another. The five balancing criteria include the following:

- Long-term effectiveness and permanence
- Reduction of TMV through treatment
- Short-term effectiveness
- Implementability
- Cost

The modifying criteria are community and state acceptance. These are evaluated following public comment on the proposed plan and are used to modify the selection of the recommended alternative. The remaining seven evaluation criteria, encompassing both threshold and balancing criteria, are briefly described in the following subsections.

5.1.1 Threshold Criteria

To be eligible for selection, an alternative must meet the two threshold criteria described below, or in the case of ARARs, must justify that a waiver is appropriate.

5.1.1.1 Overall Protection of Human Health and the Environment

Protectiveness is the primary requirement that remedial actions must meet under CERCLA. A remedy is protective if it adequately eliminates, reduces, or controls current and potential risks posed by the site through each exposure pathway. The assessment with respect to this criterion describes how the alternative achieves and maintains protection of human health and the environment.

5.1.1.2 Compliance with ARARs

Compliance with ARARs is one of the statutory requirements of remedy selection. ARARs are cleanup standards, standards of control, and other substantive environmental statutes or regulations which are either "applicable" or "relevant and appropriate" to the CERCLA cleanup action (42 United States Code 9621(d)(2)). Applicable requirements address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstances at a CERCLA site. Relevant and appropriate requirements are those that while not applicable, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to environmental or technical factors at a particular site. The assessment with respect to this criterion describes how the alternative complies with ARARs or presents the rationale for waiving an ARAR. ARARs can be grouped into the following three categories:

- **Chemical-specific:** ARARs are health- or risk-based numerical values or methodologies which, when applied to site-specific conditions, establish the amount or concentration of a chemical that may remain in or be discharged to the environment.

- **Location-specific:** ARARs restrict the concentration of hazardous substances or the conduct of activities solely because they are in specific locations, such as floodplains, wetlands, historic places, and sensitive ecosystems or habitats.
- **Action-specific:** ARARs include technology- or activity-based requirements that set controls, limits, or restrictions on design performance of remedial actions or management of hazardous constituents.

The identification of ARARs was summarized in Section 2.1 and the analysis of the potential ARARs relative to the remediation of the OMC Plant 2 Site are provided in Appendix A.

5.1.2 Balancing Criteria

The five criteria listed below are used to weigh the tradeoffs between alternatives.

5.1.2.1 Long-term Effectiveness and Permanence

This criterion reflects CERCLA's emphasis on implementing remedies that will ensure protection of human health and the environment in the long term as well as in the short term. The assessment of alternatives with respect to this criterion evaluates the residual risks at a site after completing a remedial action or enacting a no action alternative and includes evaluation of the adequacy and reliability of controls.

5.1.2.2 Reduction of Toxicity, Mobility, or Volume through Treatment

This criterion addresses the statutory preference for remedies that employ treatment of principal threat wastes as a principal element. There are no principal threat wastes when evaluating this criterion. The assessment with respect to this criterion evaluates the anticipated performance of the specific treatment technologies an alternative may employ. The criterion is specific to evaluating only how treatment reduces TMV and does not address containment actions such as capping.

5.1.2.3 Short-term Effectiveness

This criterion addresses short-term impacts of the alternatives. The assessment with respect to this criterion examines the effectiveness of alternatives in protecting human health and the environment (that is, minimizing any risks associated with an alternative) during the construction and implementation of a remedy until the response objectives have been met.

5.1.2.4 Implementability

The assessment with respect to this criterion evaluates the technical and administrative feasibility of the alternative and the availability of the goods and services needed to implement it.

5.1.2.5 Cost

Cost encompasses all engineering, construction, and O&M costs incurred over the life of the project. The assessment with respect to this criterion is based on the estimated present worth of the costs for each alternative. Present worth is a method of evaluating expenditures such as construction and O&M that occur over different lengths of time. This allows costs for remedial alternatives to be compared by discounting all costs to the year that the alternative is implemented. The present worth of a project represents the amount of money, which if invested in the initial year of the remedy and disbursed as needed, would be sufficient to cover all costs associated with the remedial action. As stated in the RI/FS guidance document (USEPA 1988b), these estimated costs are expected to provide an accuracy of plus 50 percent to minus 30 percent. Appendix B provides a breakdown of the cost estimate for each alternative.

The level of detail required to analyze each alternative with respect to the cost criteria depends on the nature and complexity of the site, the types of technologies and alternatives being considered, and other project-specific considerations. The analysis is conducted in sufficient detail to understand the significant aspects of each alternative and to identify the uncertainties associated with the evaluation.

The cost estimates presented for each alternative have been developed strictly for comparing the alternatives. The final costs of the project and the resulting feasibility will depend on actual labor and material costs, competitive market conditions, actual site conditions, final project scope, the implementation schedule, the firm selected for final engineering design, and other variables; therefore, final project costs will vary from the cost estimates. Because of these factors, project feasibility and funding needs must be reviewed carefully before specific financial decisions are made or project budgets are established to help ensure proper project evaluation and adequate funding.

The cost estimates are order-of-magnitude estimates having an intended accuracy range of plus 50 to minus 30 percent. The range applies only to the alternatives as they are described in Section 4 and does not account for changes in the scope of the alternatives. Selection of specific process options to configure remedial alternatives is intended not to limit flexibility during remedial design, but to provide a basis for preparing cost estimates. The specific details of remedial actions and cost estimates would be refined during final design.

5.2 Detailed Analysis Alternatives

The analysis consists of detailed and comparative evaluations of the remedial alternatives.

5.2.1 Detailed Evaluation

The following alternatives were developed and described in Section 4 for the subsurface soils in the ODC and PCB DNAPL area:

- Alternative 1—No Further Action
- Alternative 2—IAC 807 or 811 cap, Institutional Controls and Monitoring
- Alternative 3—IAC 807 or 811 cap, Vertical Barrier, Institutional Controls and Monitoring
- Alternative 4—In Situ Treatment, Institutional Controls and Monitoring
- Alternative 5—Excavation and Disposal and Institutional Controls

These alternatives were evaluated in detail using the seven evaluation criteria described in Section 5.1. The detailed evaluations for these soil media alternatives are presented in Table 5-1.

5.2.2 Comparative Analysis

5.2.2.1 Overall Protection of Human Health and the Environment

The RAOs for the ODC and PCB DNAPL area at the OMC Plant 2 Site include the following:

- Prevention of construction worker human exposure, through contact, ingestion, or inhalation of contaminated soil that presents an ELCR greater than 1×10^{-4} to 1×10^{-5}.
- Remediation of soil and groundwater to the extent practicable to minimize migration of contaminants in groundwater.

The No Further Action Alternative is not protective because it allows future contact with the contaminated soils during potential redevelopment activities and does not include the remediation of the contaminated soil acting as a continuing source of contaminants to groundwater. Alternative 2 prevents contact with the contaminated soil and reduces future groundwater transport by reducing the amount of water flowing through the PCB-contaminated soil. Alternatives 3 through 5 are considered protective of human health and the environment because they all isolate the materials from human contact and include institutional controls to prevent uncontrolled excavation where necessary. A summary of the overall protectiveness of the alternatives is provided in the table below.

Overall Protection of Human Health and the Environment

Does Not Meet Criteria	Meets Criteria
1	2, 3, 4, 5

5.2.2.2 Compliance with ARARs

Alternative 1 (No Further Action) does not comply with ARARs. Alternatives 2, 3, 4 and 5 are expected to comply with ARARs. The most important ARARs to be met relate to TSCA requirements, erosion controls during demolition, and air pollution emission requirements. However, of these alternatives, only Alternative 5 includes the disposal or disturbance of contaminated soil. Specific ARARs are listed in Appendix A. A summary of the compliance with ARARs is provided in the table below.

Compliance with ARARs

Does Not Meet Criteria	Meets Criteria
1	2, 3, 4, 5

5.2.2.3 Long-term Effectiveness and Permanence

The long-term effectiveness and permanence of the alternatives is evaluated in terms of the magnitude of residual risk and the adequacy and reliability of controls. The residual risk of Alternative 1 (No Further Action) would remain unchanged. The residual risk for Alternative 2 related to contaminant migration remains as there is no source containment or removal. Alternatives 3 and 4 have similar residual risk because the soil and groundwater are contained. Alternative 3 includes groundwater capture and treatment and Alternative 4 prevents leaching and groundwater migration through solidification. Although Alternatives 3 and 4 have slightly decreased residual risk due to the isolation of PCB-impacted soil from groundwater, the anticipated migration of PCBs in groundwater under Alternatives 1 and 2 is minimal. The evaluation of PCB migration in groundwater in the RI estimated a travel time of over 1,500 years for the PCBs to migrate 50 feet. This is evidenced with PCBs only being detected in the monitoring well in the immediate vicinity of the PCB DNAPL and not in the monitoring well about 100 feet downgradient. As a result, there is not an appreciable decrease in risk through the groundwater containment. Alternative 5 has the greatest long-term effectiveness and permanence because all soil above PRGs is removed so there is no longer any source material onsite.

The adequacy and reliability of Alternatives 3, 4 and 5 are similar. The contaminants are PCBs that do not leach readily. Alternative 3 includes a cap to prevent direct contact and minimize infiltration and vertical barriers to prevent groundwater migration. These controls are also considered adequate and reliable if the cap is routinely maintained. The reliability is slightly increased with the use of the IAC 811 cap instead of the IAC 807 cap with the elimination of infiltration due to the geomembrane. Alternative 4 includes stabilization/solidification to contain contaminated soils and prevent future leaching. In comparison, Alternative 5 is considered slightly better than Alternatives 3 and 4 because it does not rely on long-term maintenance of the onsite cap system or institutional controls since all material, other than the western utility and north areas, is disposed offsite. It will, however, require maintenance of the cap system by the offsite landfill. A summary of the relative ranking of alternatives is provided in the table below.

Long-term Effectiveness and Permanence
Relative Ranking from Lowest to Highest

Lowest				Highest
0	1	2	3	4
1		2	3, 4	5

5.2.2.4 Reduction of Toxicity, Mobility, and Volume through Treatment

Alternative 4 includes a treatment process. The mobility of PCBs is reduced through in situ stabilization/solidification. Treatment residuals will consist of the solidified soil and will remain in place. Alternative 3 includes treatment, to a limited extent, through the extraction and treatment of water for gradient control. The NCP preference for treatment would be met by Alternative 4. However, the solidification is anticipated to result in an increase in volume due to the addition of the Portland cement or cement kiln dust and the soil mixing. The actual

volume increase would be dependent on the mix ratio, amendments used and the mechanical disturbance of the soil. A summary of the relative ranking of alternatives is provided in the table below.

Reduction of Toxicity, Mobility, and Volume through Treatment
Relative Ranking from Lowest to Highest

Worst				Best
0	1	2	3	4
1, 2, 5	3			4

5.2.2.5 Short-term Effectiveness

There are no additional risks associated with the actual construction and implementation of Alternative 1 because no remedial action would be taken.

Except for Alternative 1, the remedial option with the greatest protection of workers and the community is Alternative 2. This option has the least amount of truck traffic with a total estimated 2,650 truckloads, shortest construction period at 10 weeks, and does not disturb the contaminated soil. Dust generated during construction activities would be from clean materials and particulates could be readily monitored and controlled through dust suppression methods.

Alternative 3 has the least adverse impacts related to construction. To implement Alternative 3 would require 2,800 truckloads of imported clean material and a construction duration of 20 weeks. Like Alternative 2, there is no disturbance of the contaminated soil under Alternative 3, so there are minimal risks to the community or the environment. The upgrading from an IAC 807 cap to an IAC 811 cap for either Alternative 2 or 3 results in an estimated additional 600 truckloads and an additional 4 weeks of construction activities. Both increase the risks to the community and construction workers.

Alternative 4 also has minimal impact to the community. Alternative 4 has the least amount of truck traffic required and the work is performed in situ minimizing construction worker exposure and impacts to the community. However, Alternative 4 has the second longest time to meet RAOs, requiring approximately 40 weeks to implement.

Alternative 5 provides less protection to the community than the other alternatives because of the short-term impact of the large number of trucks (approximately 30,000 truckloads) required to transport the material to and from the site and through populated areas. In addition to the number of truckloads, the trucking distance is also significantly increased due to transport to both Subtitle C and D disposal facilities, which are estimated to range up to 300 miles one way from the site. Alternative 5 is also the most disruptive of the contaminated soil, increasing the potential for construction workers or community exposure through dust or spills. The exposures could be addressed through proper decontamination and properly functioning tarp systems on trucks, dust monitoring and suppression during construction, and appropriate erosion control measures. Alternative 5 requires the longest time to implement at an estimated 50 weeks.

Short-term Effectiveness
Relative Ranking from Lowest to Highest

Worst				Best
0	1	2	3	4
	5		2,3,4	1

5.2.2.6 Implementability

All of the alternatives can be implemented with readily available materials and methods. However, Alternative 5 has the greatest implementability challenge with the bracing and dewatering to allow the deep excavation to the glacial till. Alternatives 2, 3, and 4 would require institutional controls.

5.2.2.7 Cost

An overview of the cost analysis performed for this FS and the detailed breakdowns for each of the alternatives are presented in Appendix B, with the total costs listed in Table 5-1.

The No Further Action Alternative has the least present worth cost, $30,000, as the only task associated with this alternative is the 5-year review. The lowest cost alternative, excluding the No Action Alternative, is Alternative 2 at $2,200,000, since this alternative includes the less costly cap.

Alternative 3 would incur the next highest costs due to the capital costs associated with the installation of a vertical barrier. Alternative 3a includes the use of a slurry wall as the vertical barrier for a total alternative cost of $3,700,000. Alternative 3b uses sheet piling as the vertical barrier with a resulting total alternative cost of $6,700,000. The upgrade to an IAC 811 cap instead of an IAC 807 cap increases cost by an estimated $1,100,000 for Alternatives 2 and 3. Alternative 4 has a cost of $24,000,000 for the in situ stabilization/solidification of the soil. Alternative 5 would be the most costly at $48,000,000 because it involves excavation and offsite disposal of all materials.

TABLE 5-1
Detailed Evaluation of Remedial Alternatives
OMC Plant 2 FS

Alternative Description: Criterion	Alternative 1—No Further Action	Alternative 2—Illinois Administrative Code 807 or 811 Cap, Institutional Controls and Monitoring	Alternative 3—Illinois Administrative Code 807 or 811 Cap, Vertical Barrier, Institutional Controls, and Monitoring	Alternative 4—In Situ Treatment, Institutional Controls and Monitoring	Alternative 5—Excavation and Disposal and Institutional Controls
1. Overall protection of human health and the environment	▪ Direct contact with soils by a construction worker could result in unacceptable health risks. ▪ RAOs would not be met because migration of contaminants in groundwater could continue.	▪ Capping with clean soil and institutional controls will prevent direct contact risks with contaminated soils exceeding PRGs. ▪ Cap would reduce mass flux of PCBs in groundwater by preventing infiltration.	▪ Capping with clean soil and institutional controls will prevent direct contact risks with contaminated soils exceeding PRGs. ▪ Vertical barrier and groundwater extraction prevent migration of contaminants in groundwater.	▪ This alternative is expected to stabilize the soil, thus preventing continued dissolution to groundwater. ▪ Institutional controls will prevent excavation in the area where treated soil is located.	▪ Soils exceeding PRGs will be removed from the site which will eliminate onsite risk due to human contact exposure pathway and offsite transport via groundwater migration.
2. Compliance with ARARs[a]	▪ ARARs not met because no remedial action is taken to address unacceptable risk. ▪ Monitoring of soil is not conducted so remedial time frame would remain unknown.	▪ All ARARs are met. ▪ Requires proper protection of streams, wetlands, and other bodies during construction.	▪ All ARARs are met. ▪ Requires proper protection of streams, wetlands, and other bodies during construction.	▪ All ARARs are met. ▪ Requires proper protection of streams, wetlands, and other bodies during construction.	▪ All ARARs are met. ▪ Must meet substantive requirements for air pollution control using dust suppression. ▪ Requires proper protection of streams, wetlands, and other bodies during construction. ▪ Final disposition of soils will be managed according to the requirements of TSCA and Illinois solid and hazardous waste disposal regulations.
3. Long-term effectiveness and permanence					
(a) Magnitude of residual risks	▪ Risk would remain constant over decades given the very slow degradation of PCBs.	▪ Exposure to contaminants in soil would be prevented through placement of a cap and institutional controls (ICs). ▪ Minimal migration of PCBs expected given the extremely slow migration rate.	▪ Exposure to contaminants in soil would be prevented through placement of a cap and ICs. ▪ Exposure to contaminants in groundwater is prevented with hydraulic containment and control.	▪ In situ stabilization via soil mixing will reduce mobility and risks associated with the PCBs.	▪ Soil left in place after excavation would be below PRGs. Residual risk is less than USEPA risk range. ▪ Source materials are removed preventing future groundwater issues.
(b) Adequacy and reliability of controls	▪ Not applicable.	▪ Capping and institutional controls are adequate and reliable in preventing direct contact with impacted soils but will require maintenance. ▪ Institutional controls would prevent use of groundwater, but not migration of groundwater. ▪ Requires reliance on institutional controls in the West Utility Corridor and North Ditch. These controls may be necessary indefinitely under this alternative and would be implemented by Nicor and North Shore Sanitary District for protection of their workers.	▪ Containment and institutional controls are adequate and reliable in preventing direct contact with impacted soils but will require maintenance. ▪ Requires reliance on institutional controls in the West Utility Corridor and North Ditch. These controls may be necessary indefinitely under this alternative and would be implemented by Nicor and North Shore Sanitary District for protection of their workers.	▪ Stabilization/solidification and institutional controls are adequate and reliable in preventing direct contact with impacted soils. ▪ Requires reliance on institutional controls in the West Utility Corridor and North Ditch. These controls may be necessary indefinitely under this alternative and would be implemented by Nicor and North Shore Sanitary District for protection of their workers.	▪ Offsite disposal is adequate and reliable in preventing direct contact and erosion of soil with concentrations exceeding TSCA. ▪ Requires reliance on institutional controls in the West Utility Corridor and North Ditch. These controls may be necessary indefinitely under this alternative and would be implemented by Nicor and North Shore Sanitary District for protection of their workers.
4. Reduction of toxicity, mobility, or volume through treatment					
(a) Treatment process used	▪ No treatment processes used.	▪ No treatment processes used.	▪ Groundwater removed by gradient control wells is treated	▪ In situ stabilization/solidification.	▪ No treatment processes used.
(b) Degree and quantity of TMV reduction	▪ None.	▪ None.	▪ The volume of groundwater treated is expected to be minimal (e.g., < 1 gpm)	▪ Would reduce the mobility by solidification with the addition of Portland cement or CKD.	▪ None.
(c) Irreversibility of TMV reduction	▪ Not applicable.	▪ Not applicable.	▪ Contaminants adsorbed on granular-activated carbon (GAC) and subsequently destroyed during carbon regeneration.	▪ Cement-based S/S stabilized wastes are vulnerable to the same physical and chemical degradation processes as concrete and other cement-based materials.	▪ Not applicable.
(d) Type and quantity of treatment residuals	▪ Not applicable	▪ Not applicable.	▪ Minimal GAC usage.	▪ Treatment residuals consist of 201,700 yd^3 of encapsulated soils. Volume may increase from addition of stabilizing amendments and mechanical-mixing of the soil.	▪ Not applicable
(e) Statutory preference for treatment as a principal element	▪ Preference not met because no treatment included.	▪ Preference not met because no treatment included.	▪ Preference not met because treatment is not a significant component of the remedy.	▪ Meets the preference for treatment.	▪ Preference not met because no treatment included.

TABLE 5-1
Detailed Evaluation of Remedial Alternatives
OMC Plant 2 FS

Alternative Description: Criterion	Alternative 1—No Further Action	Alternative 2—Illinois Administrative Code 807 or 811 Cap, Institutional Controls and Monitoring	Alternative 3—Illinois Administrative Code 807 or 811 Cap, Vertical Barrier, Institutional Controls, and Monitoring	Alternative 4—In Situ Treatment, Institutional Controls and Monitoring	Alternative 5—Excavation and Disposal and Institutional Controls
5. Short-term effectiveness					
(a) Protection of workers during remedial action	▪ No remedial construction, so no risks to workers.	▪ Impacted soil is currently located beneath a clean cover, so exposure to contaminants is not expected. Fugitive dust emissions may occur during regrading of the clean cover materials. Air monitoring and measures would be implemented to control dust. ▪ Moderate risks to workers during construction due to large equipment. Proper health and safety procedures must be followed during construction.	▪ Impacted soil is currently located beneath a clean cover, so exposure to contaminants is not expected. Fugitive dust emissions may occur during regrading of the clean cover materials. Air monitoring and measures would be implemented to control dust. ▪ Moderate risks to workers during construction due to large equipment. Proper health and safety procedures must be followed during construction. Increased risk over Alternative 2 due to the installation of the vertical barrier.	▪ Monitoring would be necessary to determine if any DNAPL vapors are emitted during the soil mixing process. ▪ Moderate risks to workers during construction due to large equipment. Proper health and safety procedures must be followed during construction. ▪ Increased risk over Alternative 3 due to the additional equipment required and the longer construction duration.	▪ Excavation soil could result in potential exposure of workers via inhalation. Proper health and safety procedures such as air monitoring and use of Level C respirator protection would be included in the Health and Safety Plan for construction. Increased risk over Alternatives 2 and 3 which do not disturb impacted soil. ▪ Moderate risks to workers during construction due to large equipment. Proper health and safety procedures must be followed during construction. Increased risk over Alternatives 2, 3 and 4 due to the duration and excavation depth. ▪ Increased risk to truckers from accidents from increases in total trips made.
(b) Protection of community during remedial action	▪ No remedial construction, so no short-term risks to community.	▪ There are limited risks to the community during construction, due to limited traffic access for trucks hauling cap materials. ▪ Fugitive dust emissions are expected during regrading of the clean cap materials. Air monitoring and measures would be implemented to control emissions. ▪ There are short-term safety-related risks to community due to the number of trucks used to transport cap materials. An estimated 2,650 truckloads of clean soil will be transported to the site over the construction duration of 10 weeks.	▪ There are limited risks to the community during construction, due to limited traffic access for trucks hauling cap materials. ▪ Fugitive dust emissions are expected during regrading of the clean cap materials. Air monitoring and measures would be implemented to control emissions. ▪ There are short-term safety-related risks to community due to the number of trucks used to transport cap materials. An estimated 2,800 truckloads of clean soil will be transported to the site over a period of 10 weeks. An additional 10 weeks will be required (total construction period of 20 weeks) to complete the installation of the vertical barriers and connection to the groundwater treatment system.	▪ Decreased risks to the community during construction due to the limited transport of materials on and off the site.	▪ There are limited risks to the community during excavation, due to limited traffic access for trucks hauling impacted soils. ▪ Dust emissions of contaminants could occur during excavation of impacted soil. Air monitoring and control measures would be implemented to control emissions and protect the community. ▪ There are short-term safety-related risks to community due to the high truck traffic associated with offsite disposal of soil. An estimated 30,000 truckloads will transport contaminated soil to disposal facilities and clean backfill to the site. In addition to the increased number of truckloads, the trips will be greater distances due to locations of the disposal facilities.
(c) Environmental impacts of remedial action	▪ No remedial construction, so no environmental impacts from remedial action.	▪ Stormwater re-routing would be required during and after construction.	▪ Stormwater re-routing would be required during and after construction.	▪ Stormwater re-routing would be required during and after construction. ▪ Environmental impacts will likely be limited to emissions of contaminants in dust, although minimal dust would be anticipated since the soils are saturated The impacts can be controlled through use of dust suppressants as necessary.	▪ Storm water re-routing would be required during and after excavation. ▪ Emissions of contaminants in dust may occur, although minimal dust would be anticipated since the soils are saturated. The impacts can be controlled through use of dust suppressants as necessary. ▪ Environmental impacts will include increased greenhouse gas emissions due to the increase in the number of truckloads and miles required.
(d) Time until RAOs are achieved	▪ The RAOs to prevent construction worker human exposure and groundwater transport would not be met.	▪ The RAO to prevent construction worker human exposure would be met in approximately 10 weeks.	▪ The RAOs would be met following cap and vertical barrier construction with connection to the existing treatment system. Estimated to require about 20 weeks.	▪ The RAOs would be met following solidification/stabilization. Estimated to require about 40 weeks.	▪ The excavation activities would immediately eliminate soil concentrations above PRGs. Estimated to require about 50 weeks.
6. Implementability					
(a) Technical feasibility	▪ No impediments.	▪ No impediments.	▪ No impediments.	▪ Effectiveness is accentuated by the soil mixing that allows homogenizing of soil.	▪ The main technical challenge is dewatering and excavation to depth. It is anticipated that sheet piling would be required to provide bracing and allow for the excavation and dewatering.
(b) Administrative feasibility	▪ No impediments.	▪ Requires institutional controls.	▪ Requires institutional controls.	▪ Requires institutional controls.	▪ No impediments.
(c) Availability of services and materials	▪ None needed.	▪ Services and materials are available.	▪ Services and materials are available.	▪ Services and materials are available.	▪ Services and materials are available.

TABLE 5-1
Detailed Evaluation of Remedial Alternatives
OMC Plant 2 FS

Alternative Description: Criterion	Alternative 1—No Further Action	Alternative 2—Illinois Administrative Code 807 or 811 Cap, Institutional Controls and Monitoring	Alternative 3—Illinois Administrative Code 807 or 811 Cap, Vertical Barrier, Institutional Controls, and Monitoring		Alternative 4—In Situ Treatment, Institutional Controls and Monitoring	Alternative 5—Excavation and Disposal and Institutional Controls
			Slurry Wall	Sheet Pile		
7. Total Cost						
Direct Capital Cost	$0	$1,800,000	$3,100,000	$6,100,000	$24,000,000	$48,000,000
Annual O&M Cost	$0	$27,000	$49,000	$49,000	$0	$0
Total Periodic Cost	$90,000	$90,000	$90,000	$90,000	$90,000	$90,000
Total Present Worth Cost	$30,000	$2,200,000	$3,700,000	$6,700,000	$24,000,000	$48,000,000

SECTION 6

References

CH2M HILL. 2004. *Field Sampling Plan, OMC Plant 2, Waukegan, Illinois.* November.

CH2M HILL. 2006a. *Feasibility Study Report, OMC Plant 2, Waukegan, Illinois.* December.

CH2M HILL. 2006b. *Remedial Investigation Report, OMC Plant 2, Waukegan, Illinois.* April.

CH2M HILL 2008. *Basis of Design Report Final Design for Remediation of Soil, Sediment, and Building Media, OMC Plant 2 Site, Waukegan, Illinois.* June.

CH2M HILL 2009. *Addendum to the Basis of Design Report for Remediation of Soil, Sediment, and Building Media, Final Design, OMC Plant 2, Waukegan, Illinois.* November.

Deigan & Associates, LLC. 2004. *Environmental Site Investigation Report, Former OMC Waukegan Property, Lake Michigan Lakefront Study Area, Draft.* September 14.

Illinois Administrative Code (IAC). 2002. Illinois Water Quality Standard – Groundwater Class I – Illinois Administrative Code Title 35: Environmental Protection, Subtitle F: Public Water Supplies, Chapter I: Pollution Control Board, Part 620 Groundwater Quality, Section 620.410 Groundwater Quality Standards For Class I: Potable Resource.

Illinois Environmental Protection Agency (IEPA). 1994. *Waukegan Remedial Action Plan, Stage I and II, Final Report.* December 1.

Illinois Environmental Protection Agency (IEPA). 2007. TACO – Tier 1 Groundwater Remediation Objectives for the Groundwater Component of the Groundwater Ingestion Route – Appendix B.

Kieninger, T. 2005. "Re: Request for Information." Illinois Natural Heritage Database, Illinois Department of Natural Resources–ORC. E-mail to Ryan Loveridge. September 16.

SulTRAC. 2010. *Change Condition Memorandum No. 3, Area 4, For Outboard Marine Corporation Plant 2, Soil and Sediment Remediation, Waukegan, IL.* December

SulTRAC. 2011. *Supplemental Design Report Area 3, Area 5, New Smelter Slab Area, and Concrete and Specifications for Supplemental Remedial Action, OMC Plant 2 Site, Waukegan, Lake County, Illinois.* September.

SulTRAC, 2011b. *Technical Memorandum Supplemental Investigation Areas 3, 4, 5, and 12, Outboard Marine Company (OMC) Operable Unit 4 (OU4), Waukegan, Lake County, Illinois.* March 14.

SulTRAC. 2012. *Interim Remedial Action Report – Slab, Soil, and Sediment Remediation, OMC Plant 2 Site, Waukegan, Lake County, Illinois.* February.

URS/Dames & Moore. 2000. *Phase I Environmental Site Assessment and Asbestos Survey, Outboard Marine Corporation, Lakefront Property, Waukegan, Illinois.* June 28.

U.S. Environmental Protection Agency (USEPA). 1988a. Guidance on Remedial Actions for Contaminated Groundwater at Superfund Sites.

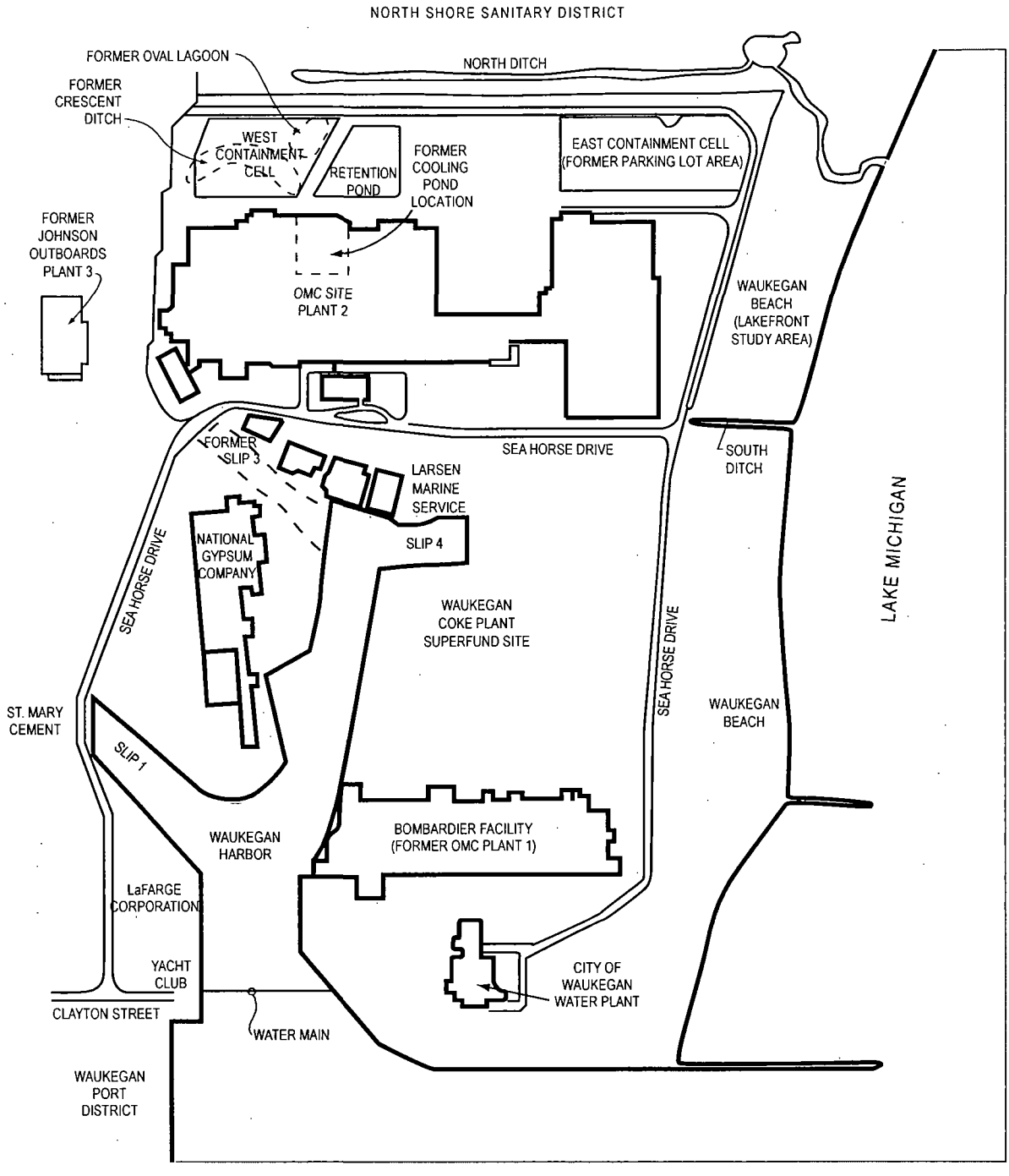
U.S. Environmental Protection Agency (USEPA). 2002. Second Five-Year Review Report for Outboard Marine Corporation Superfund Site, Waukegan, Lake County, Illinois. September.

U.S. Environmental Protection Agency (USEPA). 2007. *Record of Decision, Selected remedial alternatives for the OMC Plant 2 Operable Unit (OU#4) of the Outboard Marine Corporation, Inc. Superfund Site, Waukegan, Lake County, Illinois.* April.

U.S. Environmental Protection Agency (USEPA). 2011. *Regional Screening Level (RSL) Summary Table.* November.

Figures

Figure 1
Site Location
OMC Plant 2 Site
Waukegan, Illinois



SOURCE: ADAPTED FROM USEPA 2002

Figure 2

Vicinity Features

OMC Plant 2

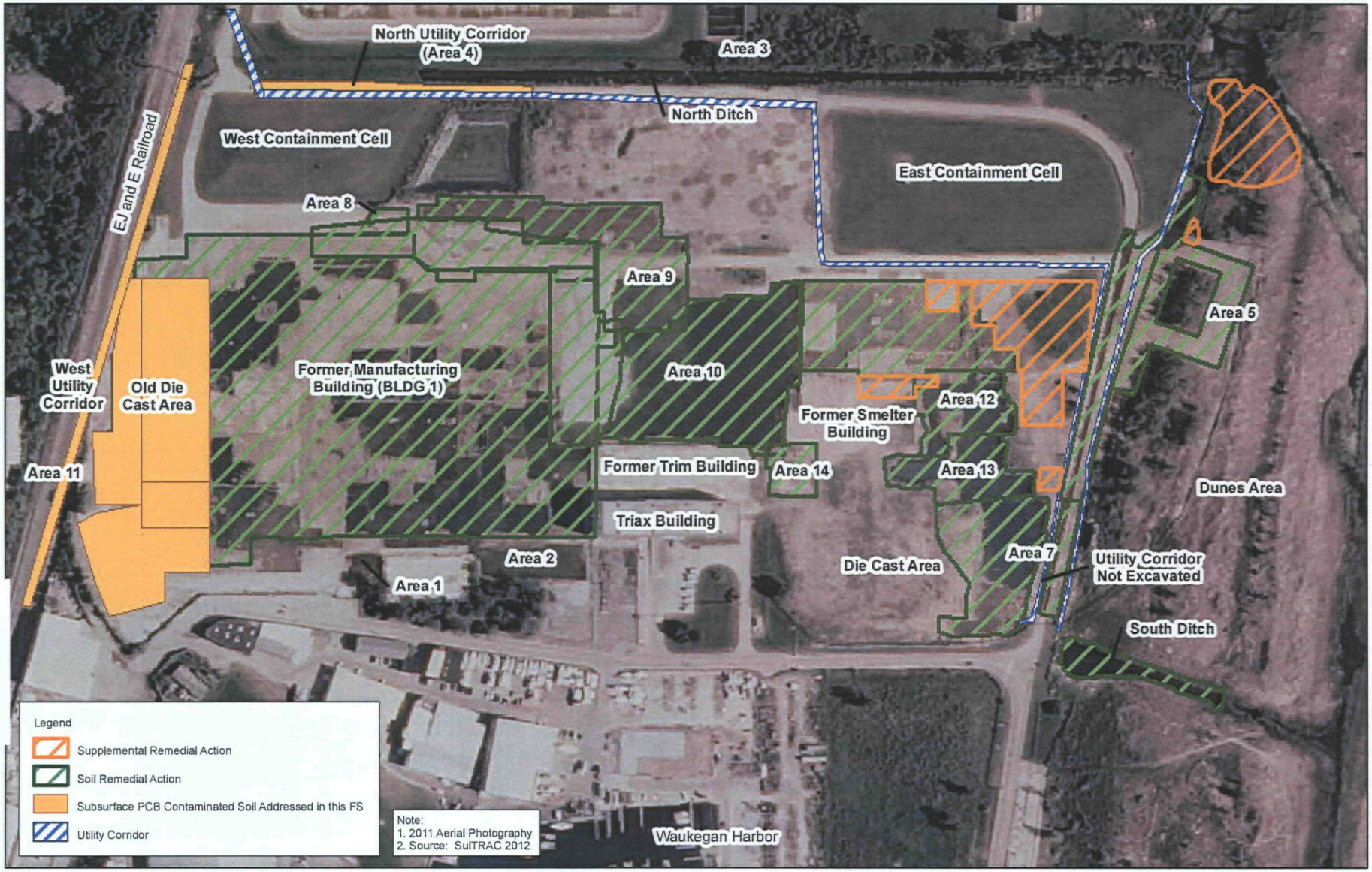
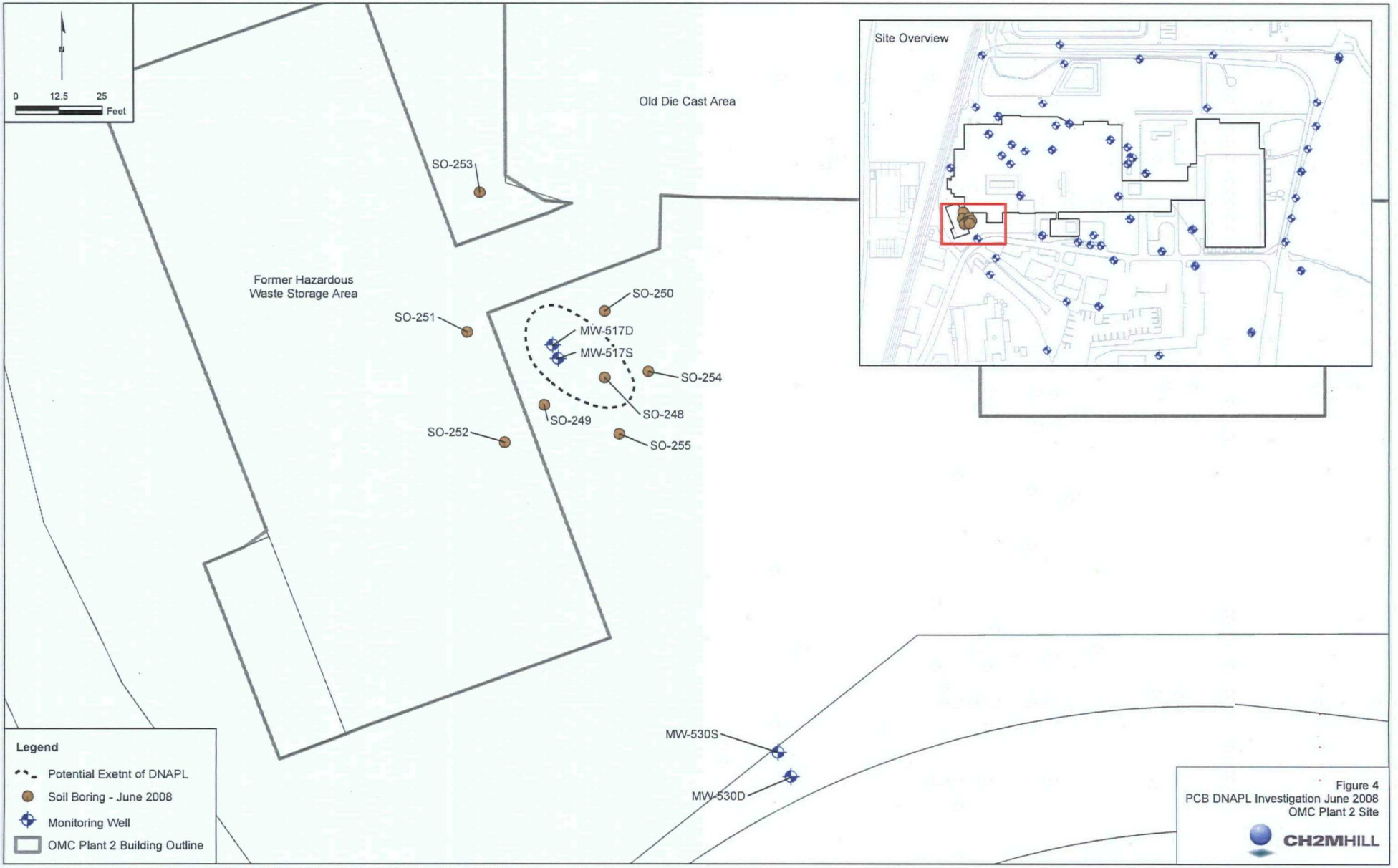


Figure 3
Soil RA Site Layout
OMC Plant 2 Site
Waukegan, Illinois



E:\EPA\186305-OMC\GIS_DATA\MXD\2012\TONYMORAN_020712\FIGURE 04 - PCB DNAPL INVESTIGATION JUNE 2008.MXD JHANSEN1 3/28/2012 2:48:28 PM

Figure 5
ODC Confirmation Sample Results
OMC Plant 2 Site
Waukegan, Illinois

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E:\EPA\186305-OMC\GIS_DATA\MXDS\2012\TONYMORAN_020712\FIGURE 05 - OLD DIECAST AREA.MXD JHANSEN1 3/28/2012 5:12:40 PM

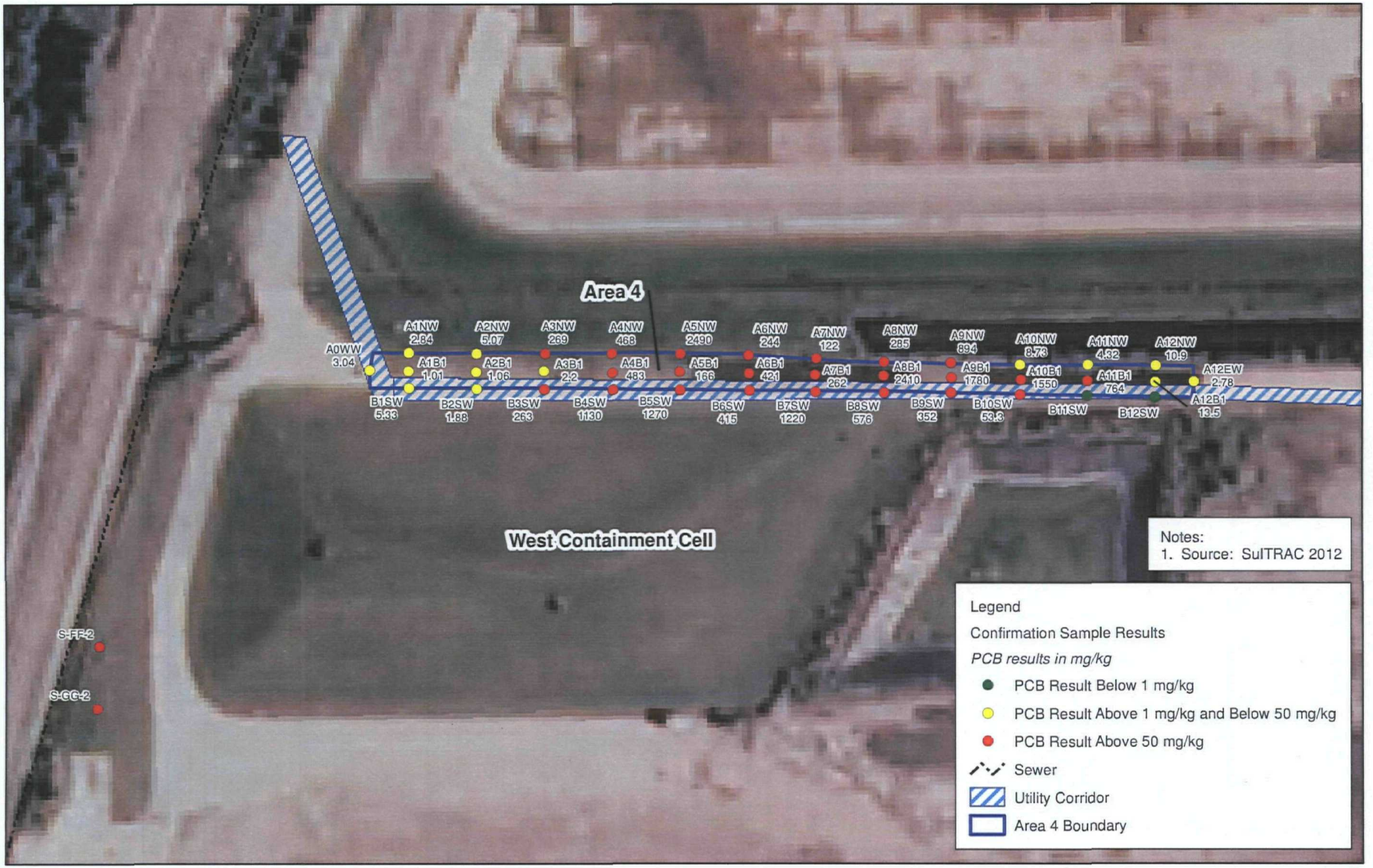

Figure 6
Area 4 Confirmation Sample Results
OMC Plant 2 Site
Waukegan, Illinois

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E:\EPA\186305-OMC\GIS_DATA\MXDS\2012\TONYMORAN_020712\FIGURE 06 - AREA 4 CONFIRMATION SAMPLE RESULTS.MXD JHANSEN1 3/30/2012 3:22:13 PM

Figure 7
Alternative 2 — Illinois Administrative Code 807 Cap, Institutional Controls and Monitoring
OMC Plant 2 Site
Waukegan, Illinois

E:\EPA\186305-OMC\GIS_DATA\MXDS\2012\TONYMORAN_020712\FIGURE 07 - ALTERNATIVE 2.MXD JHANSEN1 7/2/2012 12:35:49 PM

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Figure 8
Alternative 3 – Illinois Administrative Code 807 Cap, Vertical Barrier, Institutional Controls, and Monitoring
OMC Plant 2 Site
Waukegan, Illinois

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E:\EPA\186305-OMC\GIS_DATA\MXDS\2012\TONYMORAN_020712\FIGURE 08 - ALTERNATIVE 3.MXD JHANSEN1 7/2/2012 12:39:12 PM

Figure 9
Alternative 4 – In Situ Treatment, Institutional Controls and Monitoring
OMC Plant 2 Site
Waukegan, Illinois

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E:\EPA\186305-OMC\GIS_DATA\MXDS\2012\TONYMORAN_020712\FIGURE 09 - ALTERNATIVE 4.MXD JHANSEN1 7/2/2012 12:40:17 PM

Figure 10
Alternative 3 – Excavation and Disposal and Institutional Controls
OMC Plant 2 Site
Waukegan, Illinois

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E:\EPA\186305-OMC\GIS_DATA\MXDS\2012\TONYMORAN_020712\FIGURE 10 - ALTERNATIVE 5.MXD JHANSEN1 7/2/2012 12:41:37 PM

Appendix A
Evaluation of ARARs

APPENDIX A
Applicable or Relevant and Appropriate Requirements
OMC Plant 2 PCB-Contaminated Soil FS Report

Regulation	Requirement	ARAR Status	Analysis
Chemical-specific Applicable or Relevant and Appropriate Requirement (ARARs)			
Soil			
Toxic Substances Control Act (TSCA)	Establishes requirements and thresholds for management of PCBs.	ARAR	TSCA is relevant and appropriate to defining the management of PCBs in soils. TSCA is applicable to remedial actions managing soils contaminated with PCBs (see action-specific ARARs).
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Guidance on Land Use in the CERCLA Remedy Selection Process	Establishes appropriate considerations in defining future land use.	TBC	Provides guidance to USEPA in selecting land use for remedy selection purposes.
Illinois Administrative Code (IAC) Title 35, Part 742, Tiered Approach to Corrective Action Objectives (TACO)	TACO establishes a framework for determining soil and groundwater remediation objectives standards and for establishing institutional controls. Tier 1 remediation objectives are set at 10^{-6} excess lifetime cancer risk (ELCR) and hazard index = 1 values. Section 742.900(d) Tier 3 remediation objectives allows cleanup levels within the ELCR range of 10^{-4} to 10^{-6}.	TBC	TACO is a voluntary program and is not required (Part 742.105 (a)). It provides guidance for development of site-specific soil and groundwater remediation objectives. Will be used to establish preliminary remediation goals.
Air			
IAC Title 35, Subtitle B: Air Pollution	Regulations contain specific requirements that pertain to allowable emissions of criteria pollutants from a number of air contaminant source categories and processes.	Possible ARAR	ARAR if remedial alternative results in air emissions. Substantive requirements for air emission control must be met.
IAC Title 35, Part 212 Visible and Particulate Matter Emissions	Regulations contain specific requirements that pertain to allowable emissions of fugitive particulate matter.	ARAR	Dust control must be implemented to control visible particulate emissions during construction activities.
IAC Title 35, Part 245 Odors	Regulations specify how to determine whether a nuisance odor is present.	ARAR	Odor control may be necessary if it is determined that a nuisance odor is present.

APPENDIX A
Applicable or Relevant and Appropriate Requirements
OMC Plant 2 PCB-Contaminated Soil FS Report

Regulation	Requirement	ARAR Status	Analysis
Location-specific ARARs			
Coastal Zone Management Act 16 USC §1451 et. seq. 15 *Code of Federal Regulations* (CFR) 930	Requires that federal agencies conducting activities directly affecting the coastal zone conduct those activities in a manner that is consistent, to the maximum extent practicable, with approved state coastal zone management programs.	ARAR	Applicable to construction in the coastal zone.
Endangered Species Act of 1973 16 United States Code (USC) §1531 et seq. 50 CFR 200	Requires that Federal agencies insure that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any threatened or endangered species or destroy or adversely modify critical habitat.	ARAR	Endangered species are present in the vicinity of the OMC Plant 2 Site. Implementation of the remedial action would need to be performed in a manner to minimize the threat to their habitat.
National Historical Preservation Act 16 USC §661 et seq. 36 CFR Part 65	Establishes procedures to provide for preservation of scientific, historical, and archaeological data that might be destroyed through alteration of terrain as a result of a federal construction project or a federally licensed activity or program. If scientific, historical, or archaeological artifacts are discovered at the site, work in the area of the site affected by such discovery will be halted pending the completion of any data recovery and preservation activities required pursuant to the act and it's implementing regulations.	Not likely ARAR	May be ARAR during the remedial activities if scientific, historic, or archaeological artifacts are identified during implementation of the remedy.
Protection of Wetlands—Executive Order 11990 50 CFR Part 6, Appendix A	Requires actions to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. Appendix A requires that no remedial alternatives adversely affect a wetland if another practicable alternative is available. If none is available, effects from implementing the chosen alternative must be mitigated. Public notice and review of activities involving wetlands is required.	ARAR	The ecological risk assessment concluded that wetlands or aquatic habitat are not present onsite. Small wetlands were identified along the north and south ditches between the site and Lake Michigan.

APPENDIX A
Applicable or Relevant and Appropriate Requirements
OMC Plant 2 PCB-Contaminated Soil FS Report

Regulation	Requirement	ARAR Status	Analysis
Executive Order 11988 50 CFR Part 6, Appendix A	Requires actions to reduce the risk of flood loss; to minimize the impact of floods on human safety, health, and welfare; and to restore and preserve the natural and beneficial values served by floodplains.	TBC	Site not within floodplain.
Great Lakes Water Quality Initiative Part 132, Appendix E	Provides guidance to Great Lakes states regarding wastewater discharge, stating that lowering of water quality standards via wastewater discharge should be minimized.	TBC	Considered as guidance.
Action-specific ARARs/To be Considered (TBC)			
Fish and Wildlife Coordination Act (16 USC 661 et seq.)	The Act provides protection and consultation with the U.S. Fish and Wildlife Service and state counterpart for actions that would affect streams, wetlands, other water bodies, or protected habitats. Action taken should protect fish or wildlife, and measures should be developed to prevent, mitigate, or compensate for project-related losses to fish and wildlife.	ARAR	The Act is considered an ARAR for construction activities performed during the implementation of remedies that may affect the drainage ditches.
Occupational Safety and Health Act (29 USC 61 et seq.)	The Occupational Safety and Health Act was passed in 1970 to ensure worker safety on the job. The U.S. Department of Labor oversees the Act. Worker safety at hazardous waste sites is specifically addressed under 29 CFR 1910.120: Hazardous Waste Operations and Emergency Response; general worker safety is covered elsewhere within the law.	TBC	Onsite construction activities performed during the implementation of remedies have the potential to expose workers to contaminants. However, ARARs apply to regulations designed to protect the environment and do not generally apply to occupational safety regulations.
Clean Air Act; National Ambient Air Quality Standards (NAAQS) Section 109 40 CFR 50-99	The Clean Air Act is intended to protect the quality of air and promote public health. Title I of the Act directed the USEPA to publish national ambient air quality standards for "criteria pollutants." In addition, USEPA has provided national emission standards for hazardous air pollutants under Title III of the Clean Air Act. Hazardous air pollutants are designated hazardous substances under CERCLA.	ARAR	The Act is considered an ARAR for remedies that involve creation of air emissions, such as excavation activities that might create dust or treatment systems that might emit volatile organic compounds.

APPENDIX A
Applicable or Relevant and Appropriate Requirements
OMC Plant 2 PCB-Contaminated Soil FS Report

Regulation	Requirement	ARAR Status	Analysis
	The Clean Air Act amendments of 1990 greatly expanded the role of National Emission Standards for Hazardous Air Pollutants by designating 179 new hazardous air pollutants and directed USEPA to attain maximum achievable control technology standards for emission sources. Such emission standards are potential ARARs if remedial technologies (such as incinerators or air strippers) produce air emissions of regulated hazardous air pollutants. Specifies requirements for air emissions such as particulates, sulfur dioxide, VOCs, hazardous air pollutants, and asbestos.		
Hazardous Materials Transportation Act; 49 CFR 100-109 Transportation of hazardous materials.	Specific DOT requirements for labeling, packaging, shipping papers, and transport by rail, aircraft, vessel, and highway.	Possible ARAR	Offsite shipment of hazardous waste may occur.
Resource Conservation and Recovery Act (RCRA), (42 USC 321 et seq.)	RCRA was passed in 1976. It amended the Solid Waste Disposal Act by including provisions for hazardous waste management. Authority for implementation of RCRA in Illinois was given to the State of Illinois. See Illinois ARARs below under Title 35 IAC Parts 720 to 730.	Possible ARAR	There is no documented evidence of disposal of listed hazardous waste at the site. Soil excavated for onsite ex situ treatment or offsite disposal may however be characteristic hazardous waste. See Illinois ARARs below for more details of specific requirements.
40 CFR 268 Land Disposal Restrictions	The land disposal restrictions require treatment before land disposal for a wide range of hazardous wastes.	Possible ARAR	ARAR for disposal of hazardous waste. Applicable to soils that are a characteristic hazardous waste or that contain a listed waste. Contaminated soils must meet the higher of 10 times the universal treatment standard or a 90% reduction of the contaminant concentration.
Toxic Substances Control Act (TSCA); 15 USC 2601 et seq.)	The Toxic Substances Control Act, created in 1976, instituted a range of control measures, primarily record-keeping and reporting requirements, to document the production and use of hazardous chemicals, primarily polychlorinated biphenyls.	ARAR	The Act applies to remedies that involve sites with polychlorinated biphenyl contamination.

APPENDIX A
Applicable or Relevant and Appropriate Requirements
OMC Plant 2 PCB-Contaminated Soil FS Report

Regulation	Requirement	ARAR Status	Analysis
TSCA PCB Remediation Wastes; 40 CFR 761.61	Specifies requirements for self-implementing onsite cleanup of PCB remediation waste.	TBC	Requirements are not binding on CERCLA sites (761.61 (a)(1)(ii)).
TSCA Cleanup Levels; (761.61(a)(4)	Bulk remediation waste cleanup levels are as follows: • High-occupancy areas- < or = 1 ppm < or = 10 ppm if capped with 6-inch concrete or asphalt or 10 inches compacted soil) • Low-occupancy areas- < or = 25 ppm Non-porous surfaces cleanup levels are: • High-occupancy areas- < or = 10 µg/100 cm^2 • Low-occupancy areas- < 100 µg/100 cm^2	TBC	Requirements are not binding on CERCLA sites (761.61 (a)(1)(ii)).
TSCA Site Cleanup; (761.61(a)(5)(B)(2)(iii)	Bulk remediation waste: • PCBs > 50 mg/kg must be disposed of in a TSCA chemical waste landfill or a RCRA hazardous waste. • PCBs < 50 mg/kg may be disposed in Subtitle D Solid Waste landfill permitted for this waste.	Possible ARAR	Excavated soils for offsite disposal with PCBs > 50 mg/kg will be disposed in accordance with these requirements. Non-porous and porous material will be disposed in accordance with TSCA requirements.
TSCA Performance-based Cleanup; (761.61(b)(3))	Material that has been dredged or excavated from waters of the United States must be managed in accordance with a permit issued under section 404 of the Clean Water Act, or the equivalent of such a permit.	Not an ARAR	Excavation or dredging of PCB contaminated sediment is not included in the OMC Plant 2 operable unit.

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Applicable or Relevant and Appropriate Requirements
OMC Plant 2 PCB-Contaminated Soil FS Report

Regulation	Requirement	ARAR Status	Analysis
TSCA (40 CFR 761.65) Storage for Disposal	Bulk PCB remediation waste containing > 50 mg/kg PCBs may be stored onsite for up to 180 days, provided controls are in place for prevention of dispersal by wind or generation of leachate. Storage site requirements include a foundation below the liner, a liner, a cover, and a run-on control system.	Possible ARAR	ARAR for excavated soils with PCBs > 50 mg/kg that are stored onsite. An extension on the 180-day storage limit could be obtained if needed through a notification to USEPA per 40 CFR 761.65 (a).
IAC Title 35, Environmental Protection, Subtitle B: Air Pollution	This part describes permits and emission standards to protect air quality.	ARAR	This part is considered an ARAR for remedies that involve creation of air emissions, such as excavation activities that might create dust or treatment systems that might emit volatile organic compounds.
IAC Title 35, Part 212, Subpart K, Fugitive Particulate Matter	Site construction and processing activities would be subject to Sections 212.304 to .310 and .312, which relate to dust control.	ARAR	Remedial action may generate fugitive dust. Rules require dust control for storage piles, conveyors, onsite traffic, and processing equipment. An operating program (plan) is required and is to be designed for significant reduction of fugitive emissions.
IAC Title 35, Part 218, Organic Material Emission Standards and Limitations for the Chicago Area (includes Lake County); Subpart C: Miscellaneous Equipment; 218.141 Separation Operations	Air pollution control requirements for effluent water separator receiving effluent water with more than 200 gal/day of free-phase organic material.	Not an ARAR	Not an ARAR. Onsite wastewater treatment is not likely to treat organic pure phase liquids at rates exceeding 200 gal/day.
IAC Title 35, Part 218, Organic Material Emission Standards and Limitations for the Chicago Area (includes Lake County); Subpart K: Use of Organic Material; 218.301-.303	The discharge of greater than 8 lbs/hr of VOC from any emission unit is prohibited.	Not an ARAR	Not an ARAR. The discharge of greater than 8 lbs/hr of VOC from any aspect of the remedial action is not likely.
IAC Title 35, Part 228 Asbestos	Requirements to limit asbestos emissions from a variety of sources including demolition.	Not an ARAR	Excavation of soil is not expected to uncover asbestos containing material.

APPENDIX A
Applicable or Relevant and Appropriate Requirements
OMC Plant 2 PCB-Contaminated Soil FS Report

Regulation	Requirement	ARAR Status	Analysis
IAC Title 35, Subtitle G: Waste Disposal, Subchapter c: Hazardous Waste Operating Requirements, Parts 720- 729.	RCRA was passed in 1976. It amended the Solid Waste Disposal Act by including provisions for hazardous waste management. The statute sets out to control the management of hazardous waste from inception to ultimate disposal. RCRA is linked closely with CERCLA, and the CERCLA list of hazardous substances includes all RCRA hazardous wastes. RCRA applies only to remedies that generate hazardous waste. IEPA has been given authorization to implement RCRA in Illinois. Standards applicable to hazardous waste generators, transporters and operators of hazardous waste treatment storage and disposal facilities.	Possible ARAR	There is no documented evidence of disposal of listed hazardous waste at the site. Soil excavated for onsite ex situ treatment or offsite disposal may, however, be characteristic hazardous waste.
IAC Title 35, Subchapter c, Hazardous waste Operating Requirements; Part 721 Identification and listing of hazardous waste	Soils must be managed as hazardous waste if they contain listed hazardous waste or are characteristic hazardous waste. Management of treatment residuals subject to RCRA if residuals retain characteristic.	Possible ARAR	There is no documented evidence of disposal of listed hazardous waste at the site. Soil excavated for onsite ex situ treatment or offsite disposal may, however, be characteristic hazardous waste.
IAC Title 35, Subchapter c, Part 722 Standards applicable for generators of hazardous waste	Establishes regulation covering activities of generators of hazardous wastes. Requirements include ID number, record keeping, and use of uniform national manifest.	Possible ARAR	Applicable if wastes are RCRA hazardous and go offsite.
IAC Title 35, Subchapter c, Part 723 Standards applicable for transporters of hazardous waste	The transport of hazardous waste is subject to requirements including DOT regulations, manifesting, record keeping, and discharge cleanup.	Possible ARAR	Applicable if wastes are RCRA hazardous and go offsite.
IAC Title 35, Subchapter c, Part 724.110 to 724.119 Subpart B—General Facility Standards	General requirements and application of section 264 standards.	Not likely an ARAR	Applicable if an RCRA hazardous waste disposal facility is constructed onsite.

APPENDIX A
Applicable or Relevant and Appropriate Requirements
OMC Plant 2 PCB-Contaminated Soil FS Report

Regulation	Requirement	ARAR Status	Analysis
IAC Title 35, Subchapter c, Part 724.190 to 724.201 Subpart F—Releases from Solid Waste Management Units	Requirements for wastes contained in solid waste management units.	TBC	Investigation and remediation is performed under the USEPA Superfund program with RCRA requirements for SWMUs as TBCs.
IAC Title 35, Subchapter c, Part 724.210 to 724.220 Subpart G—Closure and Post-closure	General closure and post-closure care requirements. Closure and post-closure plans (including operation and maintenance), site monitoring, record keeping, and site use restriction.	TBC	RCRA is not an ARAR for closure of site because site is not a RCRA hazardous waste treatment, storage or disposal facility. Hazardous wastes are not known to be present onsite.
IAC Title 35, Subchapter c, Part 724.270 to 724.279 Subpart I–Use and Management of Containers	Standards applicable for owners and operators of hazardous waste facilities that store containers of hazardous waste.	Possible ARAR	ARAR if remedy uses containers for storage of hazardous waste.
IAC Title 35, Subchapter c, Part 724.290 to 724.300 Subpart J–Tank Systems	Standards applicable for owners and operators that use tank systems for storing or treating hazardous waste.	Possible ARAR	ARAR if remedy uses tanks for storage of hazardous waste such as liquids that exceed TCLP limits.
IAC Title 35, Subchapter c, Part 724.320 to 724.332 Subpart K–Surface Impoundments	Standards applicable for owners and operators that use surface impoundments to treat, store or dispose of hazardous waste.	Not a likely ARAR	Surface impoundments are not likely a remedial action.
IAC Title 35, Subchapter c, Part 724.350 to 724.359 Subpart L—Waste Piles	Requirements for hazardous waste kept in piles. Requirements include liner, leachate collection unless in a container or structure.	Not likely an ARAR	Waste piles are not likely a remedial action.
IAC Title 35, Subchapter c, Part 724.370 to 724.383 Subpart M–Land Treatment	Standards applicable for owners and operators of facilities that treat or dispose of hazardous waste in land treatment units.	Not likely an ARAR	Land treatment is not likely a remedial action.
IAC Title 35, Subchapter c, Part 724.400 to 724.417 Subpart N–Landfills	Regulations for owners and operators of facilities that dispose of hazardous waste in landfills. Requirements for design, operation, and maintenance of hazardous waste landfills.	Not likely an ARAR	Not an ARAR. Landfill not a likely remedial action.

APPENDIX A
Applicable or Relevant and Appropriate Requirements
OMC Plant 2 PCB-Contaminated Soil FS Report

Regulation	Requirement	ARAR Status	Analysis
IAC Title 35, Subchapter c, Part 724.650 to 724.655 Subpart S–Special Provisions for Cleanup	Standards applicable for corrective action management units, temporary units and staging piles.	ARAR	Staging piles or temporary units may be needed for soil that may be a characteristic hazardous waste.
IAC Title 35, Subchapter c, Part 724.700 to 724.703 Subpart X–Miscellaneous Units	Standards applicable for owners and operators that treat, store or dispose of hazardous waste in miscellaneous units.	Not likely an ARAR	Other units for treatment, storage or disposal of hazardous waste are not likely to be a part of remedial actions.
IAC Title 35, Subchapter c, Part 728	Identifies land disposal restrictions and treatment requirements for materials subject to restrictions on land disposal. Must meet waste-specific treatment standards prior to disposal in a land disposal unit.	Possible ARAR	ARAR for disposal of hazardous waste. Applicable to soils that are a characteristic hazardous waste or that contain a listed waste. Contaminated soils must meet the higher of 10 times the universal treatment standard or a 90% reduction of the contaminant concentration.
IAC Title 35, Environmental Protection, Subtitle G: General Provisions, Chapter I: Pollution Control Board, Subchapter d: Underground Injection Control and Underground Storage Tank Programs; Part 730 and 738	Underground injection control and underground storage tank programs.	Possible ARAR	These regulations would be an ARAR for remedies involving use of wells for injection of materials to accelerate remediation or reinjection of treated groundwater, remedies that require installation of an underground storage tank or remedies that reinject treated water.
IAC Title 35, Subtitle G: Subchapter f: Part 740 Site Remediation Program	Presents requirements for the site remediation program.	TBC	The Illinois site remediation program requirements under Part 740 are specifically excluded for sites on the NPL (740.105-Applicability).
IAC Title 35, Subtitle G: Subchapter f: Site Remediation Program, Section 740.530 Establishment of Groundwater Management Zones.	Presents requirements for establishment of groundwater management zones (GMZ). GMZs are three dimensional areas where groundwater exceeds the groundwater standards of 35 IAC Part 620.	TBC	The Illinois site remediation program requirements under Part 740 are specifically excluded for sites on the NPL (740.105-Applicability).

APPENDIX A
Applicable or Relevant and Appropriate Requirements
OMC Plant 2 PCB-Contaminated Soil FS Report

Regulation	Requirement	ARAR Status	Analysis
IAC Title 35, Subtitle G: Subchapter f: Site Remediation Program, Section 740.535 Establishment of Soil Management Zones	Presents requirements for establishment of soil management zones (SMZ). SMZs can be used for onsite placement of contaminated soils for structural fill or land reclamation or consolidation of contaminated soils within a remediation site. Soil with contaminants exceeding criteria cannot be placed in areas of soil meeting criteria.	TBC	The Illinois site remediation program requirements under Part 740 are specifically excluded for sites on the NPL (740.105-Applicability).
IAC Title 35, Subtitle G: Subchapter f: Part 742; Tiered Approach to Remedial Action Objectives	The purpose of this part is to establish the procedures for investigative and remedial activities at sites where there is a release, threatened release, or suspected release of hazardous substances, pesticides, or petroleum, and for the review of those activities; establish procedures to obtain IEPA review and approval of remediation costs for the environmental remediation tax credit; and establish and administer a program for the payment of remediation costs as a brownfield site. Presents requirements for the tiered approach to corrective action objectives (TACO). Tier 1 remediation objectives are set at 10-6 ELCR and HI = 1 values. Section 742.900(d) Tier 3 remediation objectives allows cleanup levels within the ELCR range of 10^{-4} to 10^{-6}.	TBC	TACO is a voluntary program and is not required (Part 742.105 (a)). Provides guidance for development of site-specific soil and groundwater remediation objectives. Will be used to establish preliminary remediation goals.
IAC Title 35, Subtitle G: Subchapter f: Tiered Approach to Remedial Action Objectives; Subpart J Institutional Controls, Part 742.1000 to 742.1020	Provides requirements for when ICs are needed and presents requirements for implementation of ICs. ICs are needed when land use is assumed to be industrial or commercial, risk exceeds a HI = 1 or ELCR > 1 × 10-6, engineered barriers are used, exposure routes are excluded or when the point of exposure requires control.	TBC	Provides guidance for development of ICs. TACO is a TBC since it is not required.

APPENDIX A
Applicable or Relevant and Appropriate Requirements
OMC Plant 2 PCB-Contaminated Soil FS Report

Regulation	Requirement	ARAR Status	Analysis
IAC Title 35, Subtitle G: Subchapter f: Tiered Approach to Remedial Action Objectives; Subpart J Engineered Barriers, Part 742.100 to 742.1105	Provides requirements for engineered barriers. Barriers include the following: Soil component of groundwater pathway: (1) caps or walls consisting of clay, asphalt, or concrete, (2) permanent structures such as buildings, or highways. Soil ingestion pathway: (1) caps or walls consisting of clay, asphalt, or concrete, (2) permanent structures such as buildings, or highways, or (3) uncontaminated soil, sand, or gravel that is at least 3 feet in thickness. Soil inhalation pathway: (1) caps or walls consisting of clay, asphalt, or concrete, (2) permanent structures such as buildings, or highways, or (3) uncontaminated soil, sand or gravel that is at least 10 feet in thickness.	TBC	Provides guidance for development of ICs. TACO is a TBC since it is not required.
IAC Title 35, Subtitle G: Subchapter h; Illinois "Superfund" Program. Part 750 Illinois Hazardous Substances Pollution Contingency Plan	Establishes requirements for investigation and remediation of sites where there has been a release or a substantial threat of a release of a hazardous substance. Parallels USEPA's Superfund program.	TBC	Not an ARAR. The Illinois Hazardous Substances Pollution Contingency Plan is applicable to State response taken at sites which are not the subject of a federal response taken pursuant to CERCLA.

APPENDIX A
Applicable or Relevant and Appropriate Requirements
OMC Plant 2 PCB-Contaminated Soil FS Report

Regulation	Requirement	ARAR Status	Analysis
IAC Title 35, Parts 807-810 Solid Waste and Special Waste Hauling	This part describes requirements for solid waste and special waste hauling. Special waste must be treated, stored or disposed at a facility permitted to manage special waste. Presents the special waste classes and the method to determine whether the solid waste is a special waste and if so, whether it is Class A (all non-Class B special wastes) or Class B (low or moderate hazard special wastes). RCRA hazardous waste is not included within the special waste classes.	ARAR	ARAR for disposal of solid waste and special waste. Contaminated soil that is not a RCRA hazardous waste would be evaluated to determine whether it is a Class A or B special waste. Offsite disposal of special waste must be at a Solid Waste landfill permitted to receive that special waste class unless IEPA specifically allows otherwise.
IAC Title 35, Subtitle G, Chapter I, Part 811 Applies to All New Landfills	Requirements for new solid waste landfills. Standards for new solid waste landfills may be potentially considered relevant and appropriate as related to the design, construction, monitoring, and O&M of an on-Facility Area capping system. Outlines requirements for disposal of inert wastes (Subpart B), putrescible and chemical wastes (Subpart C), and special wastes (Subpart D).	ARAR	This is an ARAR for Alternatives 2 and 3, which include onsite capping of wastes that have been treated and rendered non-hazardous, or are non-hazardous due to the Bevill exemption.
IAC Title 35, Subpart A–General Standards for All Landfills	Location standards, operating standards, closure, and post-closure maintenance.	Possible ARAR	ARAR if a new solid waste landfill is a remedial action.
IAC Title 35, Subpart C–Putrescible and Chemical Waste Landfills General	Location standards, liner and leachate collection system requirements, final cover requirements.	Possible ARAR	ARAR if a new solid waste landfill is a remedial action.
IAC Title 35, Subpart C–Putrescible and Chemical Waste Landfills Facility Location (811.302)	Location of landfill including setback zone, proximity to sole source aquifer, residences, schools, hospitals, or runways.	Possible ARAR	ARAR if a new solid waste landfill is a remedial action.
IAC Title 35, Subtitle H: Part 900 Noise	Regulations contain specific requirements that pertain to nuisance noise levels	Possible ARAR	ARAR. Noise levels will need to be controlled if noise reaches nuisance levels.
Lake County Stormwater Management Commission, Watershed Development Ordinance	Regulations specify performance standards for stormwater control	ARAR	ARAR. Remedial actions need to be evaluated relative to stormwater controls if they disturb more than 5,000 square feet of soil. http://www.co.lake.il.us/smc/regulatory/wdo/docs.asp

Appendix B
Cost Estimates

Cost Comparison for Total Costs of Remedial Alternatives
OMC Plant 2 Superfund Site, Old Die Cast Area
Waukegan, Illinois
Feasibility Study

Date 4/27/2012
Base Year 2012

	Alternative 1	Alternative 2	Alt 2 or 3 Add On	Alternative 3a	Alternative 3b	Alternative 4	Alternative 5
	No Action	IAC 807 Cap and Institutional Controls	Upgrade to IAC 811 Cap	IAC 807 Cap, Slurry Wall and Institutional Controls	IAC 807 Cap, Sheet Pile Wall and Institutional Controls	In-Situ Treatment and Institutional Controls	Excavation and Disposal and Instutional Controls
Main Components		- Institutional Controls - IAC 807 Cap	-IAC 811 Cap to Replace IAC 807 Cap Under Alt 2 or 3	- Same as Alternative 2 - Slurry Wall	- Same as Alternative 2 - Sheet Pile Wall	- Institutional Controls - In-Situ Treatment	- Excavation and Removal - Disposal
Total Project Duration (Years)	30	30	30	30	30	30	30
Capital Cost	$0	$1,800,000	$1,000,000	$3,100,000	$6,100,000	$24,000,000	$48,000,000
Annual O&M Cost	$0	$27,000	$11,000	$49,000	$49,000	$0	$0
Total Periodic Cost	$90,000	$90,000	$0	$90,000	$90,000	$90,000	$90,000
Total Present Value	$30,000	$2,200,000	$1,100,000	$3,700,000	$6,700,000	$24,000,000	$48,000,000

Disclaimer: The information in this cost estimate is based on the best available information regarding the anticipated scope of the remedial alternatives. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternatives. This is an order-of-magnitude cost estimate that is expected to be within
-30 to +50 percent of the actual project costs.

Alternative: **Alternative 1**
Name: **No Action**

COST ESTIMATE SUMMARY

Site: OMC Plant 2 Superfund Site, Old Die Cast Area
Location: Waukegan, Illinois
Phase: Feasibility Study
Base Year: 2012
Date: Apr-12

Description: 5 Yr review

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
No construction				$0	
TOTAL CAPITAL COST				**$0**	

OPERATIONS AND MAINTENANCE COST

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
TOTAL ANNUAL O&M COST				**$0**	

PERIODIC COSTS

DESCRIPTION	YEAR	QTY	UNIT	UNIT COST	TOTAL	NOTES
5 year Review	5	1	LS	$15,000	$15,000	
5 year Review	10	1	LS	$15,000	$15,000	
5 year Review	15	1	LS	$15,000	$15,000	
5 year Review	20	1	LS	$15,000	$15,000	
5 year Review	25	1	LS	$15,000	$15,000	
5 year Review	30	1	LS	$15,000	$15,000	
				Total	$90,000	
TOTAL ANNUAL PERIODIC COST					**$90,000**	

PRESENT VALUE ANALYSIS

Discount Rate = 7.0%

COST TYPE	YEAR	TOTAL COST	TOTAL COST PER YEAR	DISCOUNT FACTOR	PRESENT VALUE	NOTES
CAPITAL COST	0	$0	$0	1.00	$0	
ANNUAL O&M COST	1 to 30	$0	$0	12.4	$0	
PERIODIC COST	5	$15,000	$15,000	0.71	$10,695	
PERIODIC COST	10	$15,000	$15,000	0.51	$7,625	
PERIODIC COST	15	$15,000	$15,000	0.36	$5,437	
PERIODIC COST	20	$15,000	$15,000	0.26	$3,876	
PERIODIC COST	25	$15,000	$15,000	0.18	$2,764	
PERIODIC COST	30	$15,000	$15,000	0.13	$1,971	
		$100,000			$32,367	
TOTAL PRESENT VALUE OF ALTERNATIVE					**$30,000**	

SOURCE INFORMATION

1. United States Environmental Protection Agency. July 2000. A Guide to Preparing and Documenting Cost Estimates During the Feasibility Study. EPA 540-R-00-002. (USEPA, 2000).

Alternative: **Alternative 2**
Name: **IAC 807 Cap and Institutional Controls**

COST ESTIMATE SUMMARY

Site: OMC Plant 2 Superfund Site, Old Die Cast Area
Location: Waukegan, Illinois
Phase: Feasibility Study
Base Year: 2012
Date: Apr-12

Description: - Institutional Controls
- IAC 807 Cap

Field Duration: 8-10 weeks
Truck loads, import materials: 2,650

CAPITAL COSTS

DESCRIPTION		QTY	UNIT	UNIT COST	TOTAL	NOTES
Institutional Controls						
Site Plans		1	LS	50,000	$50,000	Including Soil Management Plan, Institutional Controls & Permits
Predesign Investigations						
Survey site		1	LS	10,000	$10,000	Topo/Site Features
Pre-Design Drilling Investigation		1	LS	100,000	$100,000	Includes Drilling and Oversight
Analytical Testing		1	LS	40,000	$40,000	
SUBTOTAL					$150,000	
Site Preparation						
Silt Fencing		2,400	FT	3.45	$8,280	Recent 2012 Supply and Install Quotations
Clear and Grub		1	AC	7,769	$7,769	Recent 2012 Supply and Install Quotations
Gravel Entrance		1	LS	3,000	$3,000	
SUBTOTAL					$19,049	
Mobilization/Demobilization		5%			$952	
Subcontractor General Conditions		15%			$2,857	
SUBTOTAL					$22,859	
5 Acre Cover Construction						
Borrow Source Prequalification Testing		35	EA	750	$26,250	Recent 2012 Similar project quotations
Rough Grading of Consolidation Area		24,200	SY	2.50	$60,500	Recent 2012 Similar project quotations
Subgrade Fill	> 5 mile haul	15,000	CY	8.50	$127,500	Recent 2012 Similar project quotations
Compacted Soil Layer (24-inch thick)	20 mile haul	16,133	CY	17	$274,267	Recent 2012 Similar project quotations
Vegetation Layer (6-inches thick)	20 mile haul	4,033	CY	27	$108,900	Recent 2012 Similar project quotations
Seeding Vegetation Cover		5	AC	2,000	$10,000	Recent 2012 Similar project quotations
Stormwater Improvements (swales)		2,400	LF	4.74	$11,376	Recent 2012 Similar project quotations
Check Dams		12	EA	1,500	$18,000	Recent 2012 Similar project quotations
Outlet Protection		1	LS	3,000	$3,000	Recent 2012 Similar project quotations
SUBTOTAL					$639,793	
Mobilization/Demobilization		5%			$31,990	

Alternative:	**Alternative 2**			**COST ESTIMATE SUMMARY**	
Name:	**IAC 807 Cap and Institutional Controls**				
Subcontractor General Conditions	15%			$95,969	
SUBTOTAL				$767,751	
Third Party Oversight (Soil testing, lab and field)					
Field Inspections of Soil	180	HR	85	$15,300	Based on 3 weeks of Compacted Clay Placement
Geotechnical Laboratory Testing	1	LS	15,000	$15,000	
SUBTOTAL				$30,300	
SUBTOTAL				$1,020,000	
General Contractor	15%			$153,000	
Contingency	25%			$255,000	10% Scope + 15% Bid
SUBTOTAL				$1,428,000	
Project Management	6%			$85,680	USEPA 2000, p. 5-13, $500K-$2M
Remedial Design	12%			$171,360	USEPA 2000, p. 5-13, $500K-$2M
Construction Management	8%			$114,240	USEPA 2000, p. 5-13, $500K-$2M
SUBTOTAL				$371,280	
TOTAL CAPITAL COST				**$1,800,000**	

OPERATIONS AND MAINTENANCE COST

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Annual Cover Inspection and Repair					
Cover Inspection	4	HR	$100	$400	
Cover Repair	1	LS	$7,678	$7,678	Assumes 1% of cover repaired
Annual Report	1	LS	$7,500	$7,500	
SUBTOTAL				$15,578	
Allowance for Misc. Items	20%			$3,116	
SUBTOTAL				$18,693	
Contingency	25%			$4,673	10% Scope + 15% Bid
SUBTOTAL				$23,366	
Project Management	5%			$1,168	
Technical Support	10%			$2,337	
TOTAL ANNUAL O&M COST				**$27,000**	

Alternative: **Alternative 2** — **COST ESTIMATE SUMMARY**

Name: **IAC 807 Cap and Institutional Controls**

PERIODIC COSTS

DESCRIPTION	YEAR	QTY	UNIT	UNIT COST	TOTAL	NOTES
5 year Review	5	1	LS	$15,000	$15,000	
5 year Review	10	1	LS	$15,000	$15,000	
5 year Review	15	1	LS	$15,000	$15,000	
5 year Review	20	1	LS	$15,000	$15,000	
5 year Review	25	1	LS	$15,000	$15,000	
5 year Review	30	1	LS	$15,000	$15,000	
				Total	$90,000	
TOTAL ANNUAL PERIODIC COST					**$90,000**	

PRESENT VALUE ANALYSIS

Discount Rate = 7.0%

COST TYPE	YEAR	TOTAL COST	TOTAL COST PER YEAR	DISCOUNT FACTOR	PRESENT VALUE	NOTES
CAPITAL COST	0	$1,800,000	$1,800,000	1.00	$1,800,000	
ANNUAL O&M COST	1 to 30	$54,000	$27,000	12.4	$335,044	
PERIODIC COST	5	$15,000	$15,000	0.71	$10,695	
PERIODIC COST	10	$15,000	$15,000	0.51	$7,625	
PERIODIC COST	15	$15,000	$15,000	0.36	$5,437	
PERIODIC COST	20	$15,000	$15,000	0.26	$3,876	
PERIODIC COST	25	$15,000	$15,000	0.18	$2,764	
PERIODIC COST	30	$15,000	$15,000	0.13	$1,971	
		$1,900,000			$2,167,411	
TOTAL PRESENT VALUE OF ALTERNATIVE					**$2,200,000**	

SOURCE INFORMATION

1. United States Environmental Protection Agency. July 2000. A Guide to Preparing and Documenting Cost Estimates During the Feasibility Study. EPA 540-R-00-002. (USEPA, 2000).

Alternative: **Alternative 2 or 3 Add On**
Name: **Upgrade to IAC 811 Cap**

COST ESTIMATE SUMMARY

Site: OMC Plant 2 Superfund Site, Old Die Cast Area
Location: Waukegan, Illinois
Phase: Feasibility Study
Base Year: 2012
Date: Mar-12

Description: Upgrade from IAC 807 to IAC 811 cap. No other changes made to the alternatives.

Field Duration: Additional 4 weeks
Additional truck loads, import materials: 600

CAPITAL COSTS

DESCRIPTION		QTY	UNIT	UNIT COST	TOTAL	NOTES
Institutional Controls						
Site Plans			LS	$50,000	$0	Including Soil Management Plan, Institutional Controls & Permits
Predesign Investigations						
Survey site			LS	$10,000	$0	Topo/Site Features
Pre-Design Drilling Investigation			LS	$75,000	$0	Includes Drilling and Oversight
Analytical Testing			LS	$25,000	$0	
Geotechnical Testing			LS	$12,000	$0	Permeability, Strength, Grain Size/Plasticity
SUBTOTAL					$0	
Site Preparation						
Silt Fencing			FT	$3.45	$0	Recent 2012 Supply and Install Quotations
Clear and Grub			AC	$7,769	$0	Recent 2012 Supply and Install Quotations
Gravel Entrance			LS	$3,000	$0	
SUBTOTAL					$0	
Mobilization/Demobilization		5%			$0	
Subcontractor General Conditions		15%			$0	
SUBTOTAL					$0	
5 Acre Cover Construction						
Borrow Source Prequalification Testing		8	EA	$750	$6,000	Recent 2012 Similar project quotations. Assume 1 sample per 1000 cy
Rough Grading of Consolidation Area			SY	$2.50	$0	Recent 2012 Similar project quotations
Subgrade Fill	> 5 mile haul		CY	$8.50	$0	Recent 2012 Similar project quotations
Freeze/Thaw Soil (3-feet thick)		24,200	CY	$12.00	$290,400	General Fill Import, Place Compact
Bentomat Geosynthetic Clay Liner		29,040	SY	$5.50	$159,720	Area of cover plus 20% (replaces 24-inch layer)
40-mil LLDPE Geomembrane		29,040	SY	$7.50	$217,800	Area of cover plus 20% for overlap and waste
Double-Sided Drainage Geocomposite		29,040	SY	$4.00	$116,160	Area of cover plus 20% for overlap and waste
Compacted Soil Layer (24-inch thick)	20 mile haul	(16,133)	CY	$17.00	($274,267)	Replaced with 3' of freeze/thaw compacted soil
Vegetation Layer (6-inches thick)	20 mile haul		CY	$27.00	$0	Recent 2012 Similar project quotations
Seeding Vegetation Cover			AC	$2,000	$0	Recent 2012 Similar project quotations
Stormwater Improvements (swales)			LF	$4.74	$0	Recent 2012 Similar project quotations

Alternative: **Alternative 2 or 3 Add On**
Name: **Upgrade to IAC 811 Cap**

COST ESTIMATE SUMMARY

Check Dams		EA	$1,500	$0	Recent 2012 Similar project quotations
Outlet Protection		LS	$3,000	$0	Recent 2012 Similar project quotations
SUBTOTAL				$515,813	
Mobilization/Demobilization	5%			$25,791	
Subcontractor General Conditions	15%			$77,372	
SUBTOTAL				$618,976	
Vertical Containment Barrier					
One-Pass Slurry Wall		SF	$6.50	$0	Provided By Dewind - One Pass Trenching
Working Platform/Bench		SY	$2.50	$0	Rough Grading, Same as for Cover
Geotextile		SY	$3.65	$0	GSE
Geo-Grid		SY	$5.50	$0	GSE
Piezometers		EA	$2,000	$0	2-inch PVC - 25 feet long, slotted screen
Vertical Gradient Control Extraction Wells and piping		EA	$7,000	$0	Type 316 Stainless Steel Schedule 10S 4-inch
Tie-in and Upgrades to Existing Gradient Control System		LS	$100,000	$0	
SUBTOTAL				$0	
Mobilization/Demobilization	5%			$0	
Subcontractor General Conditions	15%			$0	
SUBTOTAL				$0	
Third Party Oversight (Soil testing, lab and field)					
Field Inspections of Soil		HR	$85	$0	Based on 3 weeks of Compacted Soil Placement
Geotechnical Laboratory Testing		LS	$15,000	$0	
Field Inspection of Geosynthetic	240	HR	$85	$20,400	Based on 4 weeks of Geosynthetic Installation
Geosynthetic Laboratory Testing	1	LS	$7,500	$7,500	
SUBTOTAL				$0	
SUBTOTAL				$620,000	
General Contractor	15%			$93,000	
Contingency	25%			$155,000	10% Scope + 15% Bid
SUBTOTAL				$868,000	
Project Management	5%			$43,400	USEPA 2000, p. 5-13, $2M-$10M
Remedial Design	8%			$69,440	USEPA 2000, p. 5-13, $2M-$10M
Construction Management	6%			$52,080	USEPA 2000, p. 5-13, $2M-$10M
SUBTOTAL				$164,920	
TOTAL CAPITAL COST				**$1,000,000**	

Alternative: **Alternative 2 or 3 Add On**
Name: **Upgrade to IAC 811 Cap**

COST ESTIMATE SUMMARY

OPERATIONS AND MAINTENANCE COST

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Operations and Maintenance					
Cover Annual Inspection		HR	$100	$0	
Cover Repair	1	LS	$6,190	$6,190	Assumes 1% of cover repaired
Gradient Control Electrical		MO	$250	$0	Assumes $250/month
Gradient Control Maintenance		LS	$10,000	$0	Assumes discharge sampling and treatment plant maintenance is included in the O&M of existing PCB containment cell cost
Annual Report		LS	$7,500	$0	
SUBTOTAL				$6,190	
Allowance for Misc. Items	20%			$1,238	
SUBTOTAL				$7,428	
Contingency	25%			$1,857	10% Scope + 15% Bid
SUBTOTAL				$9,285	
Project Management	5%			$464	
Technical Support	10%			$928	
TOTAL ANNUAL O&M COST				$11,000	

PERIODIC COSTS

DESCRIPTION	YEAR	QTY	UNIT	UNIT COST	TOTAL	NOTES
5 year Review	5		LS	$15,000	$0	
5 year Review	10		LS	$15,000	$0	
5 year Review	15		LS	$15,000	$0	
5 year Review	20		LS	$15,000	$0	
5 year Review	25		LS	$15,000	$0	
5 year Review	30		LS	$15,000	$0	
				Total	$0	
TOTAL ANNUAL PERIODIC COST					$0	

PRESENT VALUE ANALYSIS

Discount Rate = 7.0%

COST TYPE	YEAR	TOTAL COST	TOTAL COST PER YEAR	DISCOUNT FACTOR	PRESENT VALUE	NOTES
CAPITAL COST	0	$1,000,000	$1,000,000	1.00	$1,000,000	
ANNUAL O&M COST	1 to 30	$11,000	$11,000	12.4	$136,499	

Alternative:	**Alternative 2 or 3 Add On**					**COST ESTIMATE SUMMARY**
Name:	**Upgrade to IAC 811 Cap**					
	PERIODIC COST	5	$0	$0	0.71	$0
	PERIODIC COST	10	$0	$0	0.51	$0
	PERIODIC COST	15	$0	$0	0.36	$0
	PERIODIC COST	20	$0	$0	0.26	$0
	PERIODIC COST	25	$0	$0	0.18	$0
	PERIODIC COST	30	$0	$0	0.13	$0
			$1,000,000			$1,136,499
	TOTAL PRESENT VALUE OF ALTERNATIVE					**$1,100,000**

SOURCE INFORMATION

1. United States Environmental Protection Agency. July 2000. A Guide to Preparing and Documenting Cost Estimates During the Feasibility Study. EPA 540-R-00-002. (USEPA, 2000).

Alternative: **Alternative 3a**

Name: **IAC 807 Cap, Slurry Wall and Institutional Controls**

COST ESTIMATE SUMMARY

Site: OMC Plant 2 Superfund Site, Old Die Cast Area
Location: Waukegan, Illinois
Phase: Feasibility Study
Base Year: 2012
Date: Apr-12

Description: - Same as Alternative 2
- Slurry Wall

Field Duration: 16-20 weeks
Truck loads, import materials: 2,800

CAPITAL COSTS

DESCRIPTION		QTY	UNIT	UNIT COST	TOTAL	NOTES
Institutional Controls						
Site Plans		1	LS	$50,000	$50,000	Including Soil Management Plan, Institutional Controls & Permits
Predesign Investigations						
Survey site		1	LS	$10,000	$10,000	Topo/Site Features
Pre-Design Drilling Investigation		1	LS	$100,000	$100,000	Includes Drilling and Oversight
Analytical Testing		1	LS	$40,000	$40,000	
Geotechnical Testing		1	LS	$12,000	$12,000	Permeability, Strength, Grain Size/Plasticity
SUBTOTAL					$162,000	
Site Preparation						
Silt Fencing		2,400	FT	$3.45	$8,280	Recent 2012 Supply and Install Quotations
Clear and Grub		1	AC	$7,769	$7,769	Recent 2012 Supply and Install Quotations
Gravel Entrance		1	LS	$3,000	$3,000	
SUBTOTAL					$19,049	
Mobilization/Demobilization		5%			$952	
Subcontractor General Conditions		15%			$2,857	
SUBTOTAL					$22,859	
5 Acre Cover Construction						
Borrow Source Prequalification Testing		35	EA	$750	$26,250	Recent 2012 Similar project quotations
Rough Grading of Consolidation Area		24,200	SY	$2.50	$60,500	Recent 2012 Similar project quotations
Subgrade Fill	> 5 mile haul	15,000	CY	$8.50	$127,500	Recent 2012 Similar project quotations
Compacted Soil Layer (24-inch thick)	20 mile haul	16,133	CY	$17	$274,267	Recent 2012 Similar project quotations
Vegetation Layer (6-inches thick)	20 mile haul	4,033	CY	$27	$108,900	Recent 2012 Similar project quotations
Seeding Vegetation Cover		5	AC	$2,000	$10,000	Recent 2012 Similar project quotations
Stormwater Improvements (swales)		2,400	LF	$4.7	$11,376	Recent 2012 Similar project quotations
Check Dams		12	EA	$1,500	$18,000	Recent 2012 Similar project quotations
Outlet Protection		1	LS	$3,000	$3,000	Recent 2012 Similar project quotations
SUBTOTAL					$639,793	
Mobilization/Demobilization		5%			$31,990	
Subcontractor General Conditions		15%			$95,969	
SUBTOTAL					$767,751	

Alternative: **Alternative 3a**

Name: **IAC 807 Cap, Slurry Wall and Institutional Controls**

COST ESTIMATE SUMMARY

Vertical Containment Barrier					
One-Pass Slurry Wall	67,200	SF	$6.50	$436,800	Provided By Dewind - One Pass Trenching
Working Platform/Bench	9,600	SY	$2.50	$24,000	Rough Grading, Same as for Cover
Geotextile	9,600	SY	$3.65	$35,040	GSE
Geo-Grid	9,600	SY	$5.50	$52,800	GSE
Piezometers	8	EA	$2,000	$16,000	2-inch PVC - 25 feet long, slotted screen
Vertical Gradient Control Extraction Wells and piping	2	EA	$7,000	$14,000	Type 316 Stainless Steel Schedule 10S 4-inch
Tie-in and Upgrades to Existing Gradient Control System	1	LS	$100,000	$100,000	
SUBTOTAL				$678,640	
Mobilization/Demobilization	5%			$33,932	
Subcontractor General Conditions	15%			$101,796	
SUBTOTAL				$814,368	
Third Party Oversight (Soil testing, lab and field)					
Field Inspections of Soil	180	HR	$85	$15,300	Based on 3 weeks of Compacted Clay Placement
Geotechnical Laboratory Testing	1	LS	$15,000	$15,000	
SUBTOTAL				$30,300	
SUBTOTAL				$1,850,000	
General Contractor	15%			$277,500	
Contingency	25%			$462,500	10% Scope + 15% Bid
SUBTOTAL				$2,590,000	
Project Management	5%			$129,500	USEPA 2000, p. 5-13, $2M-$10M
Remedial Design	8%			$207,200	USEPA 2000, p. 5-13, $2M-$10M
Construction Management	6%			$155,400	USEPA 2000, p. 5-13, $2M-$10M
SUBTOTAL				$492,100	
TOTAL CAPITAL COST				**$3,100,000**	

OPERATIONS AND MAINTENANCE COST

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Operations and Maintenance					
Cover Annual Inspection	4	HR	$100	$400	
Cover Repair	1	LS	$7,678	$7,678	Assumes 1% of cover repaired
Gradient Control Electrical	12	MO	$250	$3,000	Assumes $250/month
Gradient Control Maintenance	1	LS	$10,000	$10,000	Assumes discharge sampling and treatment plant maintenance is included in the O&M of existing PCB containment cell cost
Annual Report	1	LS	$7,500	$7,500	
SUBTOTAL				$28,578	
Allowance for Misc. Items	20%			$5,716	

Alternative: **Alternative 3a**

Name: **IAC 807 Cap, Slurry Wall and Institutional Controls**

COST ESTIMATE SUMMARY

SUBTOTAL		$34,293	
Contingency	25%	$8,573	10% Scope + 15% Bid
SUBTOTAL		$42,866	
Project Management	5%	$2,143	
Technical Support	10%	$4,287	
TOTAL ANNUAL O&M COST		$49,000	

PERIODIC COSTS

DESCRIPTION	YEAR	QTY	UNIT	UNIT COST	TOTAL	NOTES
5 year Review	5	1	LS	$15,000	$15,000	
5 year Review	10	1	LS	$15,000	$15,000	
5 year Review	15	1	LS	$15,000	$15,000	
5 year Review	20	1	LS	$15,000	$15,000	
5 year Review	25	1	LS	$15,000	$15,000	
5 year Review	30	1	LS	$15,000	$15,000	
				Total	$90,000	
TOTAL ANNUAL PERIODIC COST					**$90,000**	

PRESENT VALUE ANALYSIS

Discount Rate = 7.0%

COST TYPE	YEAR	TOTAL COST	TOTAL COST PER YEAR	DISCOUNT FACTOR	PRESENT VALUE	NOTES
CAPITAL COST	0	$3,100,000	$3,100,000	1.00	$3,100,000	
ANNUAL O&M COST	1 to 30	$98,000	$49,000	12.4	$608,043	
PERIODIC COST	5	$15,000	$15,000	0.71	$10,695	
PERIODIC COST	10	$15,000	$15,000	0.51	$7,625	
PERIODIC COST	15	$15,000	$15,000	0.36	$5,437	
PERIODIC COST	20	$15,000	$15,000	0.26	$3,876	
PERIODIC COST	25	$15,000	$15,000	0.18	$2,764	
PERIODIC COST	30	$15,000	$15,000	0.13	$1,971	
		$3,300,000			$3,740,410	
TOTAL PRESENT VALUE OF ALTERNATIVE					**$3,700,000**	

SOURCE INFORMATION

1. United States Environmental Protection Agency. July 2000. A Guide to Preparing and Documenting Cost Estimates During the Feasibility Study. EPA 540-R-00-002. (USEPA, 2000).

Alternative: **Alternative 3b** **COST ESTIMATE SUMMARY**

Name: **IAC 807 Cap, Sheet Pile Wall and Institutional Controls**

Site: OMC Plant 2 Superfund Site, Old Die Cast Area
Location: Waukegan, Illinois
Phase: Feasibility Study
Base Year: 2012
Date: Apr-12

Description: - Same as Alternative 2
- Sheet Pile Wall

Field Duration: 16-20 weeks
Truck loads, import materials: 2,800

CAPITAL COSTS

DESCRIPTION		QTY	UNIT	UNIT COST	TOTAL	NOTES
Institutional Controls						
Site Plans		1	LS	$50,000	$50,000	Including Soil Management Plan, Institutional Controls & Permits
Predesign Investigations						
Survey site		1	LS	$10,000	$10,000	Topo/Site Features
Pre-Design Drilling Investigation		1	LS	$100,000	$100,000	Includes Drilling and Oversight
Analytical Testing		1	LS	$40,000	$40,000	
Geotechnical Testing		1	LS	$12,000	$12,000	Permeability, Strength, Grain Size/Plasticity
SUBTOTAL					$162,000	
Site Preparation						
Silt Fencing		2,400	FT	$3.45	$8,280	Recent 2012 Supply and Install Quotations
Clear and Grub		1	AC	$7,769	$7,769	Recent 2012 Supply and Install Quotations
Gravel Entrance		1	LS	$3,000	$3,000	
SUBTOTAL					$19,049	
Mobilization/Demobilization		5%			$952	
Subcontractor General Conditions		15%			$2,857	
SUBTOTAL					$22,859	
5 Acre Cover Construction						
Borrow Source Prequalification Testing		35	EA	$750	$26,250	Recent 2012 Similar project quotations
Rough Grading of Consolidation Area		24,200	SY	$2.50	$60,500	Recent 2012 Similar project quotations
Subgrade Fill	> 5 mile haul	15,000	CY	$8.50	$127,500	Recent 2012 Similar project quotations
Compacted Soil Layer (24-inch thick)	20 mile haul	16,133	CY	$17	$274,267	Recent 2012 Similar project quotations
Vegetation Layer (6-inches thick)	20 mile haul	4,033	CY	$27	$108,900	Recent 2012 Similar project quotations
Seeding Vegetation Cover		5	AC	$2,000	$10,000	Recent 2012 Similar project quotations
Stormwater Improvements (swales)		2,400	LF	$4.74	$11,376	Recent 2012 Similar project quotations

Alternative: **Alternative 3b**

Name: **IAC 807 Cap, Sheet Pile Wall and Institutional Controls**

COST ESTIMATE SUMMARY

	Check Dams	12	EA	$1,500	$18,000	Recent 2012 Similar project quotations
	Outlet Protection	1	LS	$3,000	$3,000	Recent 2012 Similar project quotations
	SUBTOTAL				$639,793	
	Mobilization/Demobilization	5%			$31,990	
	Subcontractor General Conditions	15%			$95,969	
	SUBTOTAL				$767,751	
Vertical Containment Barrier						
	Sheet Pile Wall	67,200	SF	$30	$2,016,000	Lakes & Rivers Contracting (PZ-22 piles)
	Working Platform/Bench	9,600	SY	$2.50	$24,000	Rough Grading, Same as for Cover
	Piezometers	8	EA	$2,000	$16,000	2-inch PVC - 25 feet long, slotted screen
	Vertical Gradient Control Extraction Wells and piping	2	EA	$7,000	$14,000	Type 316 Stainless Steel Schedule 10S 4-inch
	Tie-in and Upgrade to Existing Gradient Control System	1	LS	$100,000	$100,000	
	SUBTOTAL				$2,170,000	
	Mobilization/Demobilization	5%			$108,500	
	Subcontractor General Conditions	15%			$325,500	
	SUBTOTAL				$2,604,000	
Third Party Oversight (Soil testing, lab and field)						
	Field Inspections of Soil	180	HR	$85	$15,300	Based on 3 weeks of Compacted Clay Placement
	Geotechnical Laboratory Testing	1	LS	$15,000	$15,000	
	SUBTOTAL				$30,300	
	SUBTOTAL				$3,640,000	
	General Contractor	15%			$546,000	
	Contingency	25%			$910,000	10% Scope + 15% Bid
	SUBTOTAL				$5,096,000	
	Project Management	5%			$254,800	USEPA 2000, p. 5-13, $2M-$10M
	Remedial Design	8%			$407,680	USEPA 2000, p. 5-13, $2M-$10M
	Construction Management	6%			$305,760	USEPA 2000, p. 5-13, $2M-$10M
	SUBTOTAL				$968,240	
	TOTAL CAPITAL COST				**$6,100,000**	

Alternative: **Alternative 3b** — **COST ESTIMATE SUMMARY**

Name: **IAC 807 Cap, Sheet Pile Wall and Institutional Controls**

OPERATIONS AND MAINTENANCE COST

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Operations and Maintenance					
Cover Annual Inspection	4	HR	$100	$400	
Cover Repair	1	LS	$7,678	$7,678	Assumes 1% of cover repaired
Gradient Control Electrical	12	MO	$250	$3,000	Assumes $250/month
Gradient Control Maintenance	1	LS	$10,000	$10,000	
Annual Report	1	LS	$7,500	$7,500	
SUBTOTAL				$28,578	
Allowance for Misc. Items	20%			$5,716	
SUBTOTAL				$34,293	
Contingency	25%			$8,573	10% Scope + 15% Bid
SUBTOTAL				$42,866	
Project Management	5%			$2,143	
Technical Support	10%			$4,287	
TOTAL ANNUAL O&M COST				**$49,000**	

PERIODIC COSTS

DESCRIPTION	YEAR	QTY	UNIT	UNIT COST	TOTAL	NOTES
5 year Review	5	1	LS	$15,000	$15,000	
5 year Review	10	1	LS	$15,000	$15,000	
5 year Review	15	1	LS	$15,000	$15,000	
5 year Review	20	1	LS	$15,000	$15,000	
5 year Review	25	1	LS	$15,000	$15,000	
5 year Review	30	1	LS	$15,000	$15,000	
				Total	$90,000	
TOTAL ANNUAL PERIODIC COST					**$90,000**	

Alternative: **Alternative 3b** **COST ESTIMATE SUMMARY**

Name: **IAC 807 Cap, Sheet Pile Wall and Institutional Controls**

PRESENT VALUE ANALYSIS

Discount Rate = 7.0%

COST TYPE	YEAR	TOTAL COST	TOTAL COST PER YEAR	DISCOUNT FACTOR	PRESENT VALUE	NOTES
CAPITAL COST	0	$6,100,000	$6,100,000	1.00	$6,100,000	
ANNUAL O&M COST	1 to 30	$98,000	$49,000	12.4	$608,043	
PERIODIC COST	5	$15,000	$15,000	0.71	$10,695	
PERIODIC COST	10	$15,000	$15,000	0.51	$7,625	
PERIODIC COST	15	$15,000	$15,000	0.36	$5,437	
PERIODIC COST	20	$15,000	$15,000	0.26	$3,876	
PERIODIC COST	25	$15,000	$15,000	0.18	$2,764	
PERIODIC COST	30	$15,000	$15,000	0.13	$1,971	
		$6,300,000			$6,740,410	

TOTAL PRESENT VALUE OF ALTERNATIVE **$6,700,000**

SOURCE INFORMATION

1. United States Environmental Protection Agency. July 2000. A Guide to Preparing and Documenting Cost Estimates During the Feasibility Study. EPA 540-R-00-002. (USEPA, 2000).

Alternative: **Alternative 4**
Name: **In-Situ Treatment and Institutional Controls**

COST ESTIMATE SUMMARY

Site: OMC Plant 2 Superfund Site, Old Die Cast Area
Location: Waukegan, Illinois
Phase: Feasibility Study
Base Year: 2012
Date: Apr-12

Description: - Institutional Controls
- In-Situ Treatment

Field Duration: 35-40 weeks
Truck loads, import materials: 1,900

CAPITAL COSTS

DESCRIPTION		QTY	UNIT	UNIT COST	TOTAL	NOTES
Institutional Controls						
Site Plans		1	LS	$50,000	$50,000	Including Soil Management Plan, Institutional Controls & Permits
Predesign Investigations						
Survey site		1	LS	$10,000	$10,000	Topo/Site Features
Pre-Design Drilling Investigation		1	LS	$100,000	$100,000	Includes Drilling and Oversight
Analytical Testing		1	LS	$40,000	$40,000	
Geotechnical Testing		1	LS	$12,000	$12,000	Permeability, Strength, Grain Size/Plasticity
SUBTOTAL					$162,000	
Site Preparation						
Silt Fencing		2,400	FT	$3.45	$8,280	Recent 2012 Supply and Install Quotations
Clear and Grub		1	AC	$7,769	$7,769	Recent 2012 Supply and Install Quotations
Gravel Entrance		1	LS	$3,000	$3,000	
SUBTOTAL					$19,049	
Mobilization/Demobilization		5%			$952	
Subcontractor General Conditions		15%			$2,857	
SUBTOTAL					$22,859	
In-Situ Soil Mixing						
Mix Design Assessment/Study		1	LS	$25,000	$25,000	
In-Situ Soil Mixing		201,667	CY	$50	$10,083,333	Resolutions 2012 Discussion
Containment Berms/Working Bench		1,067	CY	$8.00	$8,533	General Fill, import, place and compact
Portland Cement		16,335	TONS	$100	$1,633,500	Assumes 6% Cement:Soil Ratio (GeoSolutions 2012 discussion)
Borrow Source Prequalification Testing		4	EA	$750	$3,000	Recent 2012 Similar project quotations
Vegetation Layer (6-inches thick)	20 mile haul	4,033	LF	$27	$108,900	Recent 2012 Similar project quotations

Alternative: **Alternative 4**

Name: **In-Situ Treatment and Institutional Controls**

COST ESTIMATE SUMMARY

Seeding Vegetation Cover	5	AC	$2,000	$10,000	Recent 2012 Similar project quotations
Stormwater Grading/Improvements	24,200	LF	$2.50	$60,500	Recent 2012 Similar project quotations
SUBTOTAL				$11,932,767	
Mobilization/Demobilization	5%			$596,638	
Subcontractor General Conditions	15%			$1,789,915	
SUBTOTAL				$14,319,320	
SUBTOTAL				$14,550,000	
General Contractor	15%			$2,182,500	
Contingency	25%			$3,637,500	10% Scope + 15% Bid
SUBTOTAL				$20,370,000	
Project Management	5%			$1,018,500	USEPA 2000, p. 5-13, >10M
Remedial Design	6%			$1,222,200	USEPA 2000, p. 5-13, >10M
Construction Management	6%			$1,222,200	USEPA 2000, p. 5-13, >10M
SUBTOTAL				$3,462,900	
TOTAL CAPITAL COST				**$24,000,000**	

OPERATIONS AND MAINTENANCE COST

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
None				$0	
SUBTOTAL				$0	
Contingency	25%			$0	10% Scope + 15% Bid
SUBTOTAL				$0	
Project Management	5%			$0	
Technical Support	10%			$0	
TOTAL ANNUAL O&M COST				**$0**	

Alternative: **Alternative 4** — **COST ESTIMATE SUMMARY**

Name: **In-Situ Treatment and Institutional Controls**

PERIODIC COSTS

DESCRIPTION	YEAR	QTY	UNIT	UNIT COST	TOTAL	NOTES
5 year Review	5	1	LS	$15,000	$15,000	
5 year Review	10	1	LS	$15,000	$15,000	
5 year Review	15	1	LS	$15,000	$15,000	
5 year Review	20	1	LS	$15,000	$15,000	
5 year Review	25	1	LS	$15,000	$15,000	
5 year Review	30	1	LS	$15,000	$15,000	
				Total	$90,000	
TOTAL ANNUAL PERIODIC COST					**$90,000**	

PRESENT VALUE ANALYSIS

Discount Rate = 7.0%

COST TYPE	YEAR	TOTAL COST	TOTAL COST PER YEAR	DISCOUNT FACTOR	PRESENT VALUE	NOTES
CAPITAL COST	0	$24,000,000	$24,000,000	1.00	$24,000,000	
ANNUAL O&M COST	1 to 30	$0	$0	12.4	$0	
PERIODIC COST	5	$15,000	$15,000	0.71	$10,695	
PERIODIC COST	10	$15,000	$15,000	0.51	$7,625	
PERIODIC COST	15	$15,000	$15,000	0.36	$5,437	
PERIODIC COST	20	$15,000	$15,000	0.26	$3,876	
PERIODIC COST	25	$15,000	$15,000	0.18	$2,764	
PERIODIC COST	30	$15,000	$15,000	0.13	$1,971	
		$24,100,000			$24,032,367	
TOTAL PRESENT VALUE OF ALTERNATIVE					**$24,000,000**	

SOURCE INFORMATION

1. United States Environmental Protection Agency. July 2000. A Guide to Preparing and Documenting Cost Estimates During the Feasibility Study. EPA 540-R-00-002. (USEPA, 2000).

Alternative: **Alternative 5**
Name: **Excavation and Disposal and Instutional Controls**

COST ESTIMATE SUMMARY

Site: OMC Plant 2 Superfund Site, Old Die Cast Area
Location: Waukegan, Illinois
Phase: Feasibility Study
Base Year: 2012
Date: Apr-12

Description: - Excavation and Removal
- Disposal

Field Duration: 45-50 weeks
Truck loads, import materials: 30,000

CAPITAL COSTS

DESCRIPTION		QTY	UNIT	UNIT COST	TOTAL	NOTES
Institutional Controls						
Site Plans		1	LS	$50,000	$50,000	Including Soil Management Plan, Institutional Controls & Permits
Predesign Investigations						
Survey site		1	LS	$10,000	$10,000	Topo/Site Features
Pre-Design Drilling Investigation		1	LS	$100,000	$100,000	Includes Drilling and Oversight
Analytical Testing		1	LS	$40,000	$40,000	
Geotechnical Testing		1	LS	$12,000	$12,000	Permeability, Strength, Grain Size/Plasticity
SUBTOTAL					$162,000	
Site Preparation						
Silt Fencing		2,400	FT	$3.45	$8,280	Recent 2012 Supply and Install Quotations
Clear and Grub		1	AC	$7,769	$7,769	Recent 2012 Supply and Install Quotations
SUBTOTAL					$16,049	
Mobilization/Demobilization		5%			$802	
Subcontractor General Conditions		15%			$2,407	
SUBTOTAL					$19,259	
Excavation and Disposal						
Waste Characterization		87	EA	$900	$78,300	
Post Excavation Sampling		87	EA	$900	$78,300	
Excavation Volume		201,667	CY	$12	$2,420,000	Assume 5 acres x 25 ft deep
Subtitle C Soil Transport	EQ, Belleviue, MI 299 mi	8,712	TON	$45	$390,734	299 x $3.00/loaded mile/20 tons/load
Disposal Volume Subtitle C		8,712	TON	$200	$1,742,404	Assumed Disposal at Wayne Disposal (EQ) (4% of Volume)
Subtitle D Soil Transport	Greater Chicago, IL	209,088	TON	$6.00	$1,254,531	40 x $3.00/loaded mile/20 tons/load
Disposal Volume Subtitle D		209,088	TON	$50	$10,454,422	Local Area Disposal (96% of Volume)

Alternative: **Alternative 5**

Name: **Excavation and Disposal and Instutional Controls**

COST ESTIMATE SUMMARY

Water Management	120	DAY	$10,000	$1,200,000	Lakes & Rivers Contracting Inc.
Excavation Support (Sheet Pile)	2,400	LF	$2,500	$6,000,000	Lakes & Rivers Contracting Inc.
Borrow Source Prequalification Testing	1	LS	$2,000	$2,000	
Excavation Backfill and Surface Grading > 5 mile haul	161,334	CY	$8.00	$1,290,669	General Fill, import, place and compact. Assumes reuse of the top 5' stripped during excavation.
SUBTOTAL				$24,911,359	
Mobilization/Demobilization	5%			$1,245,568	
Subcontractor General Conditions	15%			$3,736,704	
SUBTOTAL				$29,893,631	
SUBTOTAL				$30,120,000	
General Contractor	10%			$3,012,000	
Contingency	25%			$7,530,000	10% Scope + 15% Bid
SUBTOTAL				$40,662,000	
Project Management	5%			$2,033,100	USEPA 2000, p. 5-13, >10M
Remedial Design	6%			$2,439,720	USEPA 2000, p. 5-13, >10M
Construction Management	6%			$2,439,720	USEPA 2000, p. 5-13, >10M
SUBTOTAL				$6,912,540	
TOTAL CAPITAL COST				**$48,000,000**	

OPERATIONS AND MAINTENANCE COST

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
None				$0	
SUBTOTAL				$0	
Contingency	25%			$0	10% Scope + 15% Bid
SUBTOTAL				$0	
Project Management	5%			$0	
Technical Support	10%			$0	
TOTAL ANNUAL O&M COST				**$0**	

Alternative: **Alternative 5**

Name: **Excavation and Disposal and Instutional Controls**

COST ESTIMATE SUMMARY

PERIODIC COSTS

DESCRIPTION	YEAR	QTY	UNIT	UNIT COST	TOTAL	NOTES
5 year Review	5	1	LS	$15,000	$15,000	
5 year Review	10	1	LS	$15,000	$15,000	
5 year Review	15	1	LS	$15,000	$15,000	
5 year Review	20	1	LS	$15,000	$15,000	
5 year Review	25	1	LS	$15,000	$15,000	
5 year Review	30	1	LS	$15,000	$15,000	
				Total	$90,000	
TOTAL ANNUAL PERIODIC COST					**$90,000**	

PRESENT VALUE ANALYSIS

Discount Rate = 7.0%

COST TYPE	YEAR	TOTAL COST	TOTAL COST PER YEAR	DISCOUNT FACTOR	PRESENT VALUE	NOTES
CAPITAL COST	0	$48,000,000	$48,000,000	1.00	$48,000,000	
ANNUAL O&M COST	1 to 30	$0	$0	12.4	$0	
PERIODIC COST	5	$15,000	$15,000	0.71	$10,695	
PERIODIC COST	10	$15,000	$15,000	0.51	$7,625	
PERIODIC COST	15	$15,000	$15,000	0.36	$5,437	
PERIODIC COST	20	$15,000	$15,000	0.26	$3,876	
PERIODIC COST	25	$15,000	$15,000	0.18	$2,764	
PERIODIC COST	30	$15,000	$15,000	0.13	$1,971	
		$48,100,000			$48,032,367	
TOTAL PRESENT VALUE OF ALTERNATIVE					**$48,000,000**	

SOURCE INFORMATION

1. United States Environmental Protection Agency. July 2000. A Guide to Preparing and Documenting Cost Estimates During the Feasibility Study. EPA 540-R-00-002. (USEPA, 2000).

TABLE QTY-1
Estimated Quantities Calculations
OMC Plant 2 Superfund Site, Old Die Cast Area
Waukegan, Illinois
Feasibility Study

Description of Quantity

Estimated Quantities for:	**Alternative 2**	**IAC 807 Cap and Institutional Controls**
Silt Fencing	2,400 FT	Perimeter of Disturbance Area around entire site = 2,400';
Clear and grub area	1 AC	Minimal effort due recent site activity, assumed 1 acre for minimal work
Cover Area	5 AC	Based on approximate old die cast area
Cover Area	24,200 SY	
Sub Grade grading	15,000 CY	Estimated based on 5 acre cover with 2% slopes, import, place and compact
Soil Cover clay	16,133 CY	5 ac x 43,560 sf/ac x 2 ft /27
Soil Cover topsoil	4,033 CY	5 ac x 43,560 sf/ac x 0.5 ft /27
Stormwater Improvements (swales)	2,400 LF	Estimated as perimeter around the cover area
Check Dams	12 EA	Assumed one check dam every 200 feet around cover perimeter
Outlet Protection	1 LS	Allowance of $3,000 for outlet protection of the perimeter swale
Gravel Entrance	1 LS	Assumed $3,000 for 6-inch stone and geotextile entrance
Seeding	5 AC	
Groundwater samples	4 EA	
Surface water samples	2 EA	
Quality Assurance Field	180 HR	Soil Third Party Oversight (3 weeks for soil cover) and office support
QA Lab	1 LS	Various geotechnical tests
Pre-Design Investigation		
		25 foot deep boring locations at 25 locations at $10 per foot to delineate the ODC area. 25 foot deep boring locations at 20 locations at $10 per foot to investigate West Utility Corridor.
Drilling	1 LS	Oversight, Mob/Demob, two weeks of Per Diem
Chemical Sampling/Testing	1 LS	Samples from below water table in the ODC area to delineate boundary further. Surface and subsurface samples from the West Utility Corridor.
Geotechnical Testing	1 LS	Various Grain-size, permeability, Unconfined Compressive Strength

Add'l/changed Estimated Quantities for:	**Alternative 3a**	**IAC 807 Cap, Slurry Wall and Institutional Controls**
One-Pass Slurry Wall	67,200 SF	Approximate Cost per square foot from Dewind- 3 foot key into hard pan. 2400 Linear foot perimeter estimated to a depth of 28 feet (25 feet of overburden, 3 foot key)
Working Platform/Bench	9,600 SY	General Grading for equipment Access 12 feet wide - 2 feet deep
Geotextile	9,600 SY	Over Wall placement (8 per SY) Supply and Install
Geo-Grid	9,600 SY	Over wall Placement (8 per SY) Supply and Install
Piezometers	8 EA	One inside and outside of the wall at the 4 corners of the cover to monitor inward gradient - 25 feet Deep - PVC
2 Vertical Extraction wells for Gradient Control	2 EA	Perforated Stainless Steel extending at least 10 feet below the groundwater table (4" schedule 10S type 316 $90 per linear foot)
Tie-into existing GW extraction system West Containment Cell	1 LS	To be investigated in pre-design investigation and detailed in the Design

Add'l/changed Estimated Quantities for:	**Alternative 3b**	**IAC 807 Cap, Sheet Pile Wall and Institutional Controls**
Sheet Pile Wall	67,200 SF	Approximate Cost per square foot - 3 foot key into hard pan. 2400 Linear foot perimeter estimated to a depth of 28 feet
No Geotextile or GeoGrid required		

Add'l / Modified Estimated Quantities for:	**Alternative 4**	**In-Situ Treatment and Institutional Controls**
Mix Design Assessment/Study	1 LS	Lab testing/Compatibility
In-Situ Soil Mixing	201,667 CY	Cost per cubic yard approximate from Resolutions 2012 ($50 per CY) - from 0-25 feet bgs
Containment Berms/Working Bench	1,067 CY	2400 Linear feet 6 foot top width, 2 feet high.
Portland Cement	16,335 TONS	Assumes 6% by dry weight of Portland Cement ($100 per ton, 162 lbs per CY)
Stormwater Grading	24,200 SY	

Add'l / Modified Estimated Quantities for:	**Alternative 5**	**Excavation and Disposal and Instutional Controls**
Waste Characterization	87 EA	1 sample per 2500 sq ft of area at mid depth
Post Excavation Sampling	87 EA	1 sample per 2500 sqft of area at bottom of excavation
Excavation Volume	201,667 CY	Estimated as 25 foot depth across the entire Site (5*43560*25/27)
Transportation Subtitle C Landfill	8,712 TON	
Disposal Volume Subtitle C	8,712 TON	Assumed Hazardous for costing purposes for 4 percent of volume - EQ Landfill (1.35 ton/CY)
Transportation Subtitle D Landfill	209,088 TON	
Disposal Volume Subtitle D	209,088 TON	Assumed Non Hazardous for costing purposes for 96 percent of volume - Locall LF (1.35 ton/CY)
Water Management	120 DAY	Excavation water management - water level at 5 feet bgs with bottom of excavation and 25 feet bgs - $10,000 per day for 120 days for excavation and backfill
Excavation Support (Sheet Pile)	2,400 LF	Assume $2,500 per linear foot (Lakes and Rivers)
Excavation Backfill and Surface Grading	161,334 CY	Import, Place and Compact of granular fill